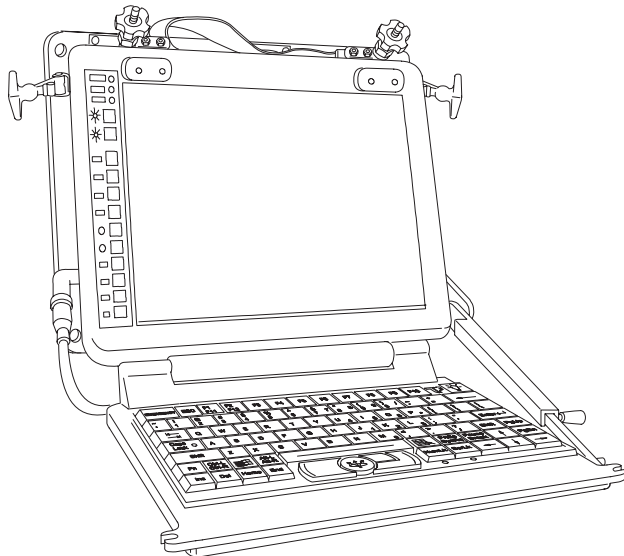## TECHNICAL MANUAL

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL
WITH REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
FOR
MORTAR BALLISTIC COMPUTER SYSTEM, M31, M577
(NSN 1220-01-484-1740)
AND
MORTAR BALLISTIC COMPUTER SYSTEM, M31, M1064
(NSN 1220-01-484-0716)

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HEADQUARTERS, DEPARTMENT OF THE ARMY

15 JULY 2001

SUMMARY OF WARNINGS, CAUTIONS, AND FIRST AID

Personnel performing operations, procedures, and practices which are included or implied in this technical manual shall observe the following warnings. Disregard of these warnings and precautionary information can cause serious injury or DEATH.

WARNING

When drilling or power grinding metal, always wear safety glasses for eye protection. Use a disposable face mask when dust and/or vapors are present.

Ensure power is turned off at power distribution assembly before opening of battery compartment or disconnection/connection of cables.

To avoid personnel injury when removing positive battery cable, avoid any contact of the positive battery cable with surrounding metal surfaces. Contact can cause battery arcing or explosion.

To avoid personnel injury due to rupture of batteries or fuel tank, ensure adequate clearance before drilling of holes.

Do not heat, burn, crush, puncture or disassemble or otherwise mutilate the batteries.

Do not short circuit.

Do not store the MBC with batteries installed during periods of nonuse in excess of 30 days.

Turn off the MBC immediately if you detect the battery compartment becoming unusually hot, hear battery cells venting (hissing sound), or smell sulfur dioxide gas.

To remove the battery, let it cool for 30 to 60 minutes, then dispose of it per current regulations.

FIRST AID

For further information on first aid, see FM 21-11.

CAUTION

In the event of contamination, display screen of computer must be decontaminated with sorbent decontaminant or 5% bleach solution to prevent damage to equipment.

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:

Original .... 0 .... 15 July 2001
Change............................. 1 ....15 April 2003
Change.............................. 2 .... 3 November 2003

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 342, CONSISTING OF THE FOLLOWING:

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a	2	2-46 - 2-47	1	3-10 blank	0
b blank	0	2-48	0	4-1	1
A - B	2	2-49 - 2-51	1	4-2	2
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1-7	1	2-66	0	4-15	1
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2-1 - 2-6	1	2-71	0	4-16.1 - 4-16.4 Added	2
2-7	0	2-72 - 2-73	1	4-17 blank	2
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2-20.1	2	2-80	1	4-21	1
2-20.2 blank Added	1	2-80.1 - 2-80.6 Added	1	4-22	0
2-21	2	2-81 - 2-90	1	4-23 - 4-26	2
2-22	1	2-90.1 - 2-90.2	2	4-27 - 4-28	1
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2-35	1	2-99	1	4-42 - 4-46	2
2-36	0	2-100	2	4-47	0
2-37	1	2-101 - 2-106	1	4-48 - 4-54	2
2-38	0	2-107 - 2-108 Added	1	5-1 - 5-2	2
2-39	2	3-1 - 3-2	2	5-2.1 - 5-2.2 Added	2
2-40	1	3-2.1 - 3-2.6	2	5-2.3 blank Added	2
2-41 - 2-42	0	3-2.7 - 3-2.10	1	5-2.4 Added	2
2-43 - 2-44	1	3-3 blank	1	5-3 - 5-6	2

*Zero in this column indicates an original page.

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A-2 blank	0
B-1 - B-4	0
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I-6 - I-7	1
I-8	0
I-9	2
I-10 - I-11	1
I-12	0
I-13	1
I-14	0
I-15	1
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Glossary-1	1
Glossary-2 - Glossary-4	0
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Authentication Page	0
Blank Page	0
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DA Form 2028	1
Metric Chart	0
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*Zero in this column indicates an original page.

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *3 November 2003*

**OPERATOR'S, UNIT, AND DIRECT SUPPORT
MAINTENANCE MANUAL
FOR
MORTAR BALLISTIC COMPUTER SYSTEM, M31, M577
(NSN 1220-01-484-1740)
AND
MORTAR BALLISTIC COMPUTER SYSTEM, M31, M1064
(NSN 1220-01-484-0716)**

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3. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration or miniature pointing hands in the affected areas.

Remove Pages	Insert Pages
a/(b blank)	a/(b blank)
A and B	A and B
i and ii	i and ii
2-11 through 2-14	2-11 through 2-14
2-20.1/(2-20.2 blank)	2-20.1/(2-20.2 blank)
2-21 and 2-22	2-21 and 2-22
2-39 and 2-40	2-39 and 2-40
2-90.1 and 2-90.2	2-90.1 and 2-90.2
2-91 through 2-100	2-91 through 2-100
3-1 and 3-2	3-1 and 3-2
3-2.1 through 3-2.6	3-2.1 through 3-2.6
4-1 through 4-16	4-1 through 4-16
None	4-16.1 through 4-16.4
4-17 through 4-20	(4-17 blank)/4-18 through 4-20
4-23 through 4-26	4-23 through 4-26
4-29 through 4-36	4-29 through 4-36
None	4-36.1 through 4-36.4
4-37 through 4-54	(4-37 blank)/4-38 through 4-54
5-1 and 5-2	5-1 and 5-2
None	5-2.1 through (5-2.3 blank)/5-2.4
5-3 through 5-5/(5-6 blank)	5-3 through 5-12

Remove Pages	Insert Pages
B-5 and B-6	B-5 and B-6
Figure C-1 through C-9-1	Figure C-1 through C-8-1
None	I-1 through I-3/(I-4 blank)
D-1 through D-6	D-1 through D-6
E-1/(E-2 blank)	E-1/(E-2 blank)
F-1 and F-2	F-1 and F-2
H-1 through H-4	H-1 through H-4
I-9 and I-10	I-9 and I-10
INDEX-1 through INDEX-3/(INDEX-4 blank)	INDEX-1 through INDEX-4

File this sheet in the front of the manual for reference purposes.

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army

0324501

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MAINTENANCE MANUAL
FOR
MORTAR BALLISTIC COMPUTER SYSTEM, M31, M577
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4. The front cover has been changed to show the new design of the mortar ballistic computer.

Remove Pages	Insert Pages
None	A and B
i and ii	i and ii
1-1 through 1-7/(1-8 blank)	1-1 through 1-7/(1-8 blank)
2-1 through 2-20	2-1 through 2-20
None	2-20.1/(2-20.2 blank)
2-21 through 2-28	2-21 through 2-28
2-31 through 2-40	2-31 through 2-40
2-43 through 2-80	2-43 through 2-80
None	2-80.1 through 2-80.6
2-81 through 2-90	2-81 through 2-90
None	2-90.1 and 2-90.2
2-91 through 2-105/(2-106 blank)	2-91 through 2-108
3-1 and 3-2	3-1 and 3-2
None	3-2.1 through 3-2.10
3-3 through 3-9/(3-10 blank)	(3-3 blank)/3-4 through 3-9/(3-10 blank)
4-1 through 4-4	4-1 through 4-4
None	4-4.1 and 4-4.2
4-5 through 4-22	(4-5 blank)/4-6 through 4-22
4-27 and 4-28	4-27 and 4-28
4-31 through 4-44	4-31 through 4-44
4-47 through 4-54	4-47 through 4-54

Remove Pages	Insert Pages
5-1/(5-2 blank)	5-1 through 5-5/(5-6 blank)
A-1/(A-2 blank)	A-1/(A-2 blank)
B-5 and B-6	B-5 and B-6
Figure C-1 through Figure C-3	Figure C-1 through Figure C-3
C-4-1 through Figure C-9	C-4-1 through Figure C-9
D-1 through D-7/(D-8 blank)	D-1 through D-7/(D-8 blank)
G-1 through G-3/(G-4 blank)	G-1 through G-3/(G-4 blank)
H-1 through H-3/(H-4 blank)	H-1 through H-4
I-1 through I-15/(I-16 blank)	I-1 through I-15/(I-16 blank)
None	J-1 through J-10
GLOSSARY-1 and GLOSSARY-2	GLOSSARY-1 and GLOSSARY-2
INDEX-1 through INDEX-3/(INDEX-4 blank)	INDEX-1 through INDEX-3/(INDEX-4 blank)
DA Form 2028 Sample	DA Form 2028 Sample
DA Form 2028	DA Form 2028
Front Cover	Front Cover

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By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army

0306301

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AND
MORTAR BALLISTIC COMPUTER SYSTEM, M31, M1064
(NSN 1220-01-484-0716)

Current as of 25 SEPTEMBER 2003 for Appendix C

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Publications and Blank Forms), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using the form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax, or E-mail your letter or DA Form 2028 direct to: AMSTA-LC-CI / TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The e-mail address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

WARNING - This document contains export-controlled technical data whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., Sec 2751 et. seq.) or Executive Order 12470. Violation of these export laws is subject to severe criminal penalties.

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CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION
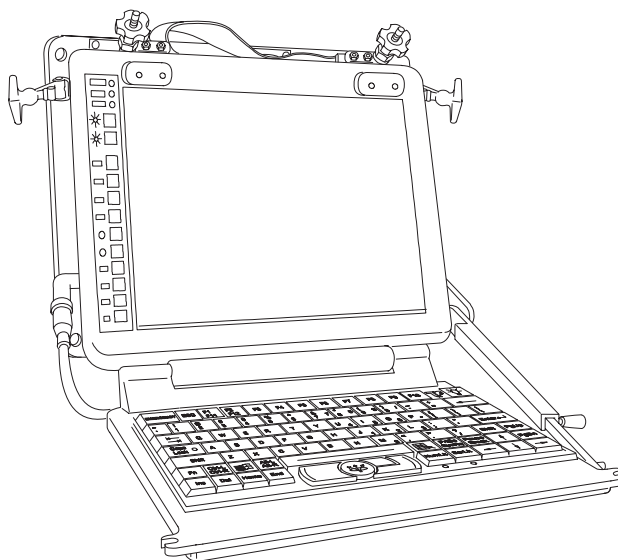
1-1. SCOPE.

    a. Type of Manual. Operator, unit, and direct support maintenance manual.

    b. Model Number and Equipment Name. Mortar Ballistic Computer System, M31.

    c. Purpose of Equipment. To compute the fire control information necessary to lay and fire the 120mm mortar system, including the use of 81mm M303 subcaliber insert.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, Functional Users Manual for the Army Maintenance Management System (TAMMS).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Procedures and materials used for the destruction of the Mortar Ballistic Computer (MBC) in order to prevent enemy use will be found in TM 750-244-7.

1-4. PREPARATION FOR STORAGE OR SHIPMENT.

Prior to shipment or long-term storage of the MBC, remove the two batteries. No other wrapping or preparation in addition to the transit/carrying case provided with the MBC required. The MBC can be transported by all commercial and armed forces means, including transportation as loose stores.

1-5. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS.

NOMENCLATURE CROSS-REFERENCE LIST

Common Name	Official Nomenclature
Cable bracket	Cable hanger
Cable bracket	Support bracket
Computer mounting bracket	Shock absorbing mount

1-6. EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your mortar ballistic computer needs improvement, let us know. Send us a SF 368 (Product Quality Deficiency Report). You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Mail it to us at: ATTN: AMSTA-AR-QAW-C, TACOM-ARDEC, 1 Rock Island Arsenal, Rock Island, IL 61299-7300 (FAX: Commercial (309) 782-6653, DSN 793-6653) (e-mail: qawqdrs@ria.army.mil). A reply will be furnished to you.

1-7. CORROSION PREVENTION AND CONTROL (CPC).

  a. Corrosion Prevention and Control (CPC) of Army Materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

  b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber, plastic, and felt. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

  c. If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will assure that the information is identified as a CPC problem.

  d. The form should be submitted to:
      ATTN: AMSTA-AR-QAW-C
      TACOM-ARDEC
      1 Rock Island Arsenal
      Rock Island, IL 61299-7300

      FAX: Commercial (309) 782-6653, DSN 793-6653
      E-mail: qawqdrs@ria.army.mil.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. Characteristics.

(1)   An extremely reliable computer terminal that provides high speed data processing, excellent resolution, and simple handling.

(2)   Has a built-in modem which allows interfacing with a wide variety of data exchange requirements.

(3)   Has a keyboard with operation similar to a common personal computer.

b. Capabilities and Features.

(1)   Computer design provides economical upgrading to match expanding demands on field terminal equipment.

(2)   Can be powered with a replaceable/rechargeable battery, a 24 VDC external power source (vehicle battery through power distribution assembly (PDA)), VAC power cable through PDA, or AC/DC adapter.

(3)   Has two PCMCIA card slots, one Type II and one Type III.

(4)   Stores three gun sections.

(5)   Stores 18 gun positions.

(6)   Stores 50 known points/targets, 16 registration points, and FPFs.

(7)   Stores 12 FO locations.

(8)   Processes three active fire-missions with one to six guns in a mission, assuming that no mission shall consist of guns from different sections and no gun shall be assigned to more than one mission concurrently.

(9)   Can accept and store 20 digital messages.

(10)   Handles full range of mortar ammunition and up to 999 rounds per type.

(11)   Conducts registration missions and applies all registration corrections automatically.

(12)   Computes and automatically applies all MET corrections.

(13)   Can store three safety fans, one for each section. Each fan is capable of ten subfans.

(14)   Accepts digital messages from Forward Entry Device (FED)/Forward Observer System (FOS) and Advanced Field Artillery Tactical Data System (AFATDS).

(15)   Provides the following safety geometry:

- No fire areas
- Coordinated fire lines
- Restricted fire areas
- Restricted fire lines
- Airspace coordination area
- Lateral boundaries
- Airspace coordination areas
- Forward line of troops
- Friendly positions

(16)   Can be hooked up to a radio or wire for digital communications.

(17)   Provides azimuth, elevation, and range from gun to impact for each round.

(18)   Provides 10 digit grid to impact for all rounds.

(19)   Batteries installed in the computer are rechargeable with use of external power source.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

The major components of the Mortar Ballistic Computer (MBC) system include two computers (one primary and one backup/check computer) with computer mounting brackets in the M577 vehicle or one computer with computer mounting bracket in the M1064 series vehicle, a Power Distribution Assembly (PDA), interface cables, and a soft carrying case. They are shown in Figure 1-1.

    a. Computers with Computer Mounting Brackets. The MBC is housed in a rugged, die cast aluminum case and is attached with locking screws to the computer mounting bracket. The keyboard and Liquid Crystal Display (LCD) display screen are built in. Function keys and indicator lamps are placed next to the LCD screen. The right side of the case includes the on/off toggle switch, a local area network (LAN) line compartment, and a battery compartment which houses two rechargeable batteries. An antenna connector and chassis ground are on the top of the case. The left side of the case has two binding posts, the power/communication connector, a parallel connector, and the keyboard connector. The bottom of the case has two access covers which cover two Personal Computer Memory Card International Association (PCMCIA) card slots and a flash memory drive.

The LCD display measures 12.1 in. (30.7 cm) diagonally. Full graphics resolution of 800 x 600 is provided. The backlighting is adjustable by the operator.

The keyboard folds against the display for protection when not in use. The QWERTY-style keypad features tactile feedback and provides alphabetic characters (A to Z), numeric characters (0 to 9), and special characters. Additional keys allow the operator to perform certain functions, to control backlighting of the keyboard, and to control power conservation modes.

    b. Power Distribution Assembly (PDA). The PDA allows the MBC to be powered by vehicle battery power. It filters vehicle power through a DC to DC power system that isolates MBC components from fluctuations in vehicle power and provides protection against reverse polarity and power surges.

    c. Interface Cables. The interface cables connect the computers with various external devices and with an external power source. Each cable is equipped with captive connector covers. A dedicated power only cable shall be used for the secondary (backup/check) computer in the M577 vehicle.

    d. Soft Carrying Case. The MBC soft carrying case provides environmental and general storage protection.
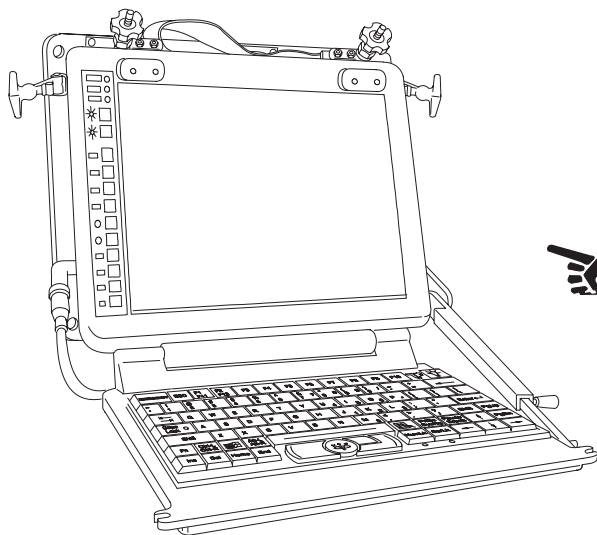
MBC COMPUTER
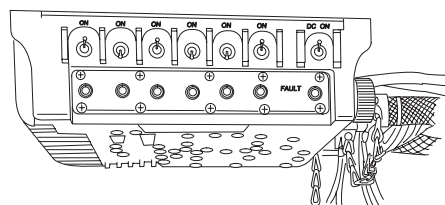
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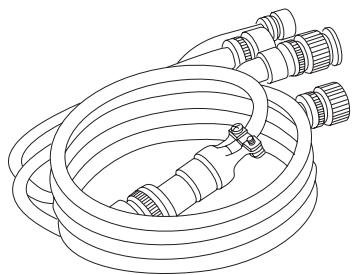
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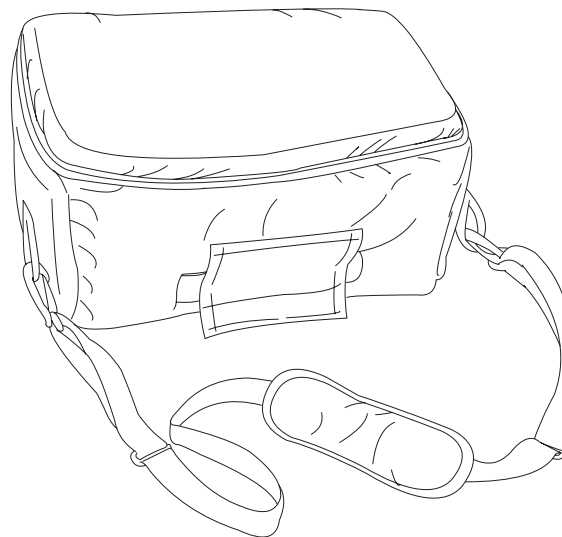
CARRYING CASE

Figure 1-1. Major Components of MBC Equipment.

1-10. EQUIPMENT DATA.

Physical Characteristics.

Weight:
18 lb (8.2 kg) (with two batteries)
21 lb (9.5 kg) (with Computer Mounting Bracket)

Dimensions (with Computer Mounting Bracket):
12.41 in. x 11.83 in. x 6.33 in. (31.52 cm x 30.05 cm x 16.08 cm)

Performance Characteristics.

Processing Speed:
- Pentium MMX, 266-Megahertz (MHz)
- Runs commercial OS applications, e.g., Windows NT

Memory Capacity:
- 128-Megabytes (MB) of Dynamic Random Access Memory (DRAM)
- 1 Gigabyte (GB) of Flash Memory

Resolution:
- 800 x 600 pixels (LCD)
- Monochrome or color (option)
- Backlit/Brightness (controllable)
- 12.1 in. (30.7 cm) diagonal

Data Port Capability:
- Dual Channel tactical modem card
- Type II and Type III PCMCIA slots (external)
- Parallel, VGA, and Ethernet Jack interfaces
- Serial interfaces (RS232 and RS422)
- Wire binding posts
- External keyboard port
- Compatible with most tactical DOD Radios/COMSEC (e.g., SINCGARS, PRC-126, EPLRS)

Power Capability:
- Rechargeable nickel metal hydride batteries
- Power adapter options: 12 VDC to 32 VDC
                            34W4 power cable
                            115 VAC with PDA
                            AC/DC adapter
- Power savings circuitry

Section III. PRINCIPLES OF OPERATION

1-11. PRINCIPLES OF OPERATION.

The Mortar Ballistic Computer (MBC) is a data computer with intelligent communication and display terminal. It is capable of interactive alphanumeric and graphic displays and high speed tactical, data communication interfaces.

A Pentium MMX 266-MHz microprocessor, controlled by a software operating system, manages computer activities, performs computations, and controls the interface with peripheral and external devices. Dynamic random access memory (DRAM) is used for temporary data storage, while the flash memory drive provides permanent storage of the operating system, application software, and user-entered data.

    a. Operator Interface. The operating system and application software provide the user with digital messaging capability. The operator enters data at the keypad, and composes and edits messages using the liquid crystal display. Completed messages are sent via a modem port or a serial port over field or public telephone lines, through various combat net radio interfaces, to other MBCs, or to peripheral devices such as a FED, FOS, or Advanced Field Artillery Tactical Data Systems (AFATDS).

If transmission is to be made on a combat net radio frequency, the MBC first monitors the frequency to ensure that it will not interfere with existing radio traffic. When a transmission opportunity is recognized, the transmission proceeds in digital bursts to minimize the possibility of message interception or jamming.

    b. Input Power. The MBC can be powered by internal rechargeable/replaceable batteries or from an externally powered 12 to 32 VDC source. External power from a VAC source can also be used when routed thorugh the PDA or AC/DC adapter. External power usage requires the use of power cables. The MBC automatically stores USE ALL data and returns to the last displayed screen, if power is lost.

    c. Battery Power. Rechargeable nickel metal hydride battery.

    d. Built-In Test (BIT). Each time power is applied to the MBC, the POST is performed during boot. A comprehensive sequence of subtests exercises MBC internal circuitry and functions. A failure of any test causes the system to halt and requires replacement action of the MBC at the operator level. When a failure occurs, prompt message will not display.

CHAPTER 2
OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. INTRODUCTION.

This chapter describes controls and indicators, preventive maintenance, and operating procedures for the Mortar Ballistic Computer (MBC).

2-2. GENERAL INFORMATION.

The MBC can operate interchangeably from internal batteries, from 24 VDC vehicle power, or from 115 VAC power source. Switchover between power modes causes no loss of information/function in the MBC.

The keypad and bezel controls can be used by an operator wearing protective Nuclear Biological Chemical (NBC) clothing. Refer to FM 3-4.

NOTE

> The MBC is equipped with a "keep alive feature" for the retention of information due to very short duration power losses. Battery replacement or change of power mode source should be performed prior to mission utilization.

2-3. CONTROLS AND INDICATORS.

Controls and indicators on the MBC consist of those located on the front bezel on the left side of the LCD display, and the alpha/numeric/symbol and function keys on the keypad.

   a. **Bezel Controls and Indicators.** Bezel-located controls (Figure 2-1) are used to adjust the display brightness and to make selections in the software program.

2-3. CONTROLS AND INDICATORS (cont).
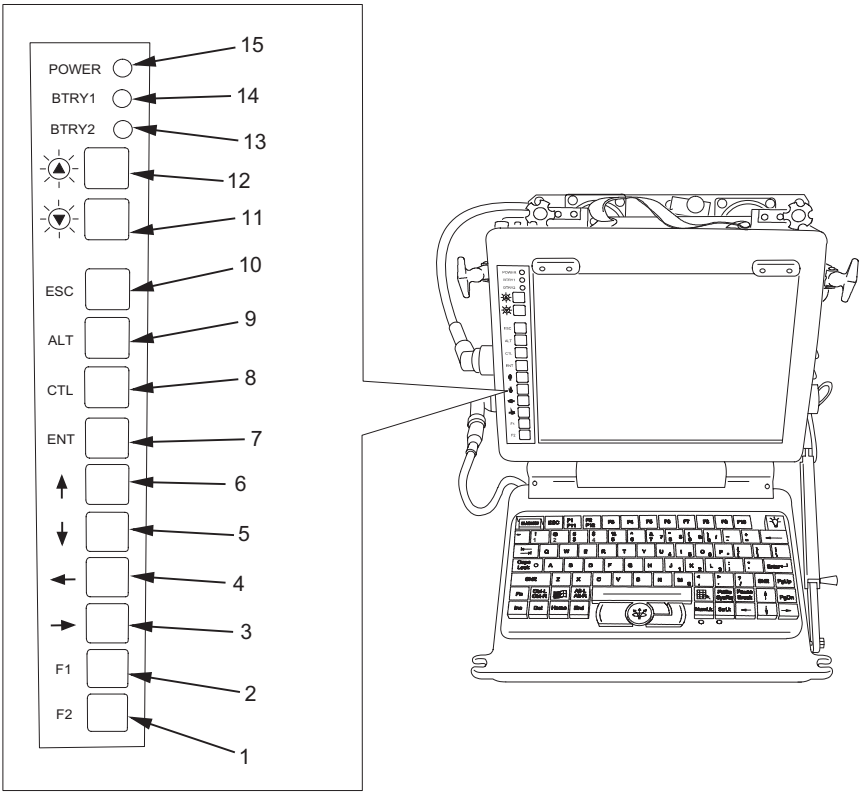
Figure 2-1. Bezel Controls and Indicators.

Table 2-1. Bezel Controls and Indicators.

Item No.	Control or Indicator	Function
1	F2 function key	Can be used to make selections in the software. Keyboard use is recommended.
2	F1 function key	Can be used to make selections in the software. Keyboard use is recommended.
3	Display right arrow key	Can be used to make selections in the software. Keyboard use is recommended.
4	Display left arrow key	Can be used to make selections in the software. Keyboard use is recommended.
5	Display down arrow key	Can be used to make selections in the software. Keyboard use is recommended.

Table 2-1. Bezel Controls and Indicators (cont).

Item No.	Control or Indicator	Function
6	Display up arrow key	Can be used to make selections in the software. Keyboard use is recommended.
7	ENT (enter) key	Brings up menu of function keys.
8	CTL (control) key	Not used in this application.
9	ALT (alternate) key	Not used in this application.
10	ESC (escape) key	Not used in this application.
11	Screen brightness intensity button	When pressed, brightness of liquid crystal display (LCD) screen decreases.
12	Screen brightness intensity button	When pressed, brightness of LCD increases.
13	BTRY2 (battery 2) indicator	Illuminates with green light when capacity of battery 2 is 50% to 100% power, with amber light when capacity is 25% to 50%, and with no illumination when capacity drops below 25%.
14	BTRY1 (battery 1) indicator	Illuminates with green light when capacity of battery 1 is 50% to 100% power, with amber light when capacity is 25% to 50%, and with no illumination when capacity drops below 25%.
15	POWER indicator	Illuminates with green light when computer is powered with external power (PDA, AC/DC adapter) and with amber light when battery power only is used.

2-3. CONTROLS AND INDICATORS (cont).

    b. Keypad. The keypad (Figure 2-2) is used to enter data.
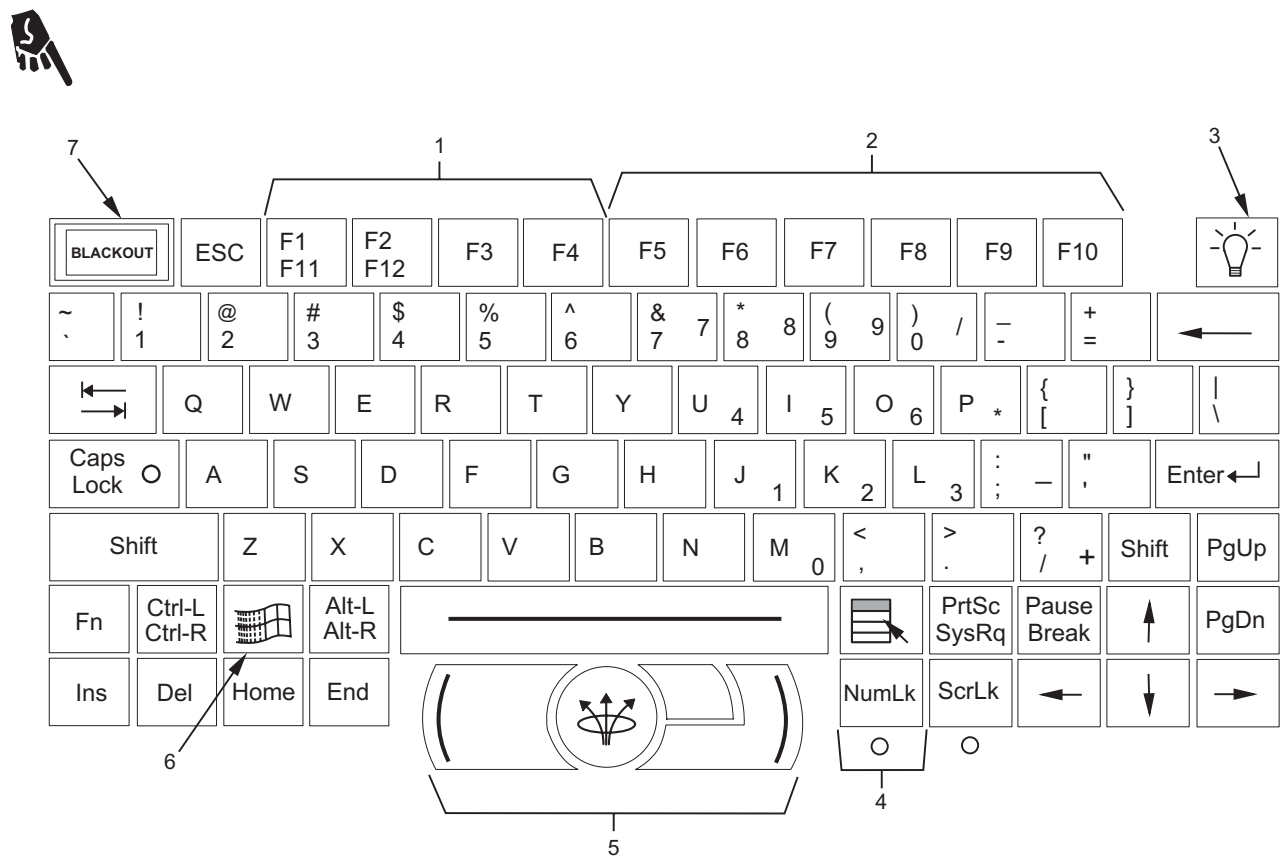
Figure 2-2. Keypad Controls and Indicators.

Table 2-2. Keypad Controls.

Item No.	Control or Indicator	Function
1	F1 through F4 function keys	Used to make selections in the software (F11 and F12 are not used).
2	F5 through F10 function keys	No function.
3	Keyboard backlighting control	Key backlight — adjustable for off, low intensity, and high intensity.
4	NumLk (number lock) key and indicator	When key is pressed and indicator is illuminated, keys with blue numerals and arithmetic functions can be used as a number pad. (Inadvertent use of NumLk key may result in inability to perform other desired functions).

Table 2-2. Keypad Controls (cont).

Item No.	Control or Indicator	Function
5	Mouse	Not used.
6	Windows key	Not used.
7	BLACKOUT key	Blacks out screen to guard against enemy detection in a tactical environment.

c. **Interface Connectors.** The main interface for the MBC is provided through the power/communication connector. Other connectors are available on the MBC computer but are generally not used. The interface connectors are shown in Figure 2-3.

LEFT SIDE   **RIGHT SIDE**

TOP
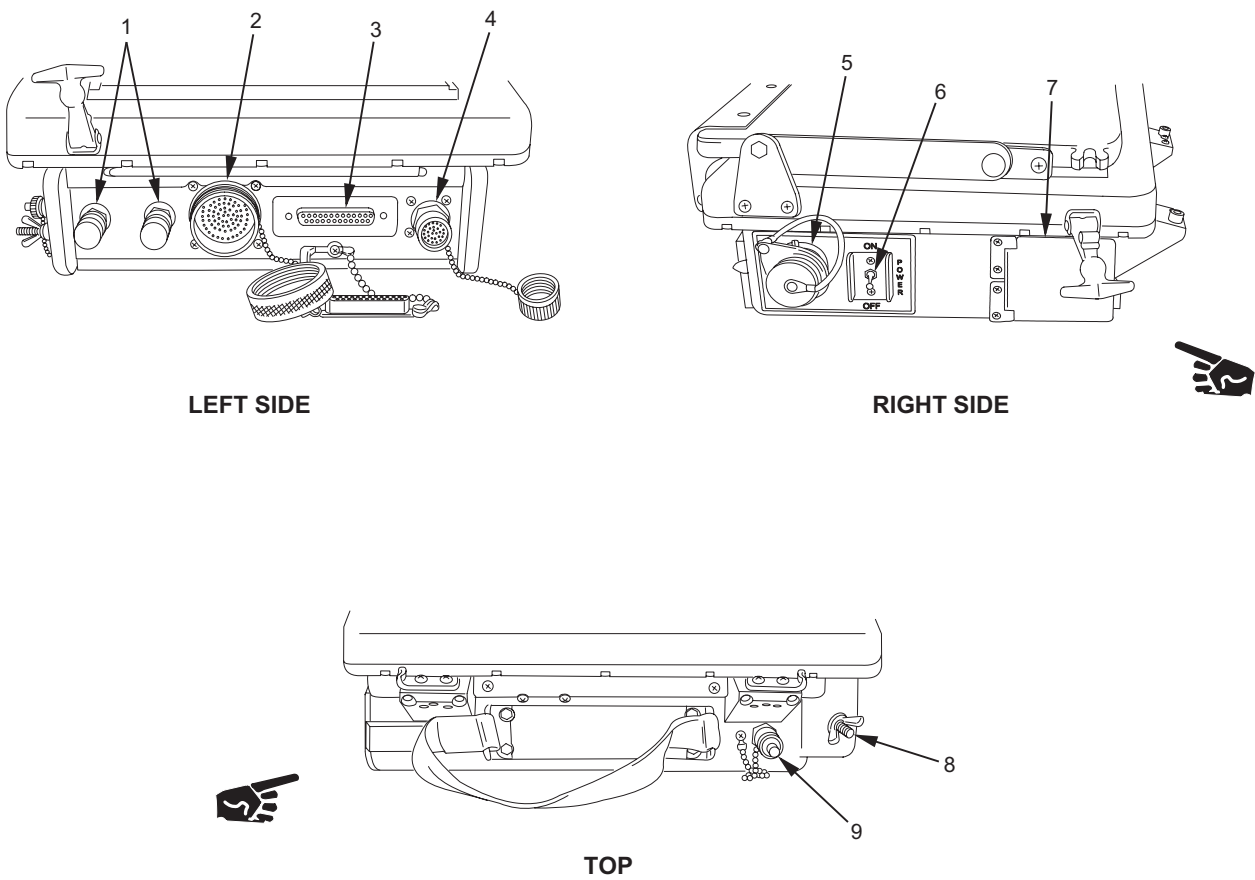
Figure 2-3. MBC Interface Connectors.

Table 2-3. MBC Interface Connectors.

Item No.	Connector	Function
1	Binding posts	Connects MBC to field telephone line.
2	J1 power/communication connector	Interfaces MBC to power distribution assembly and radios.

2-3. CONTROLS AND INDICATORS (cont).

Table 2-3. MBC Interface Connectors (cont).

Item No.	Connector	Function
3	J2 parallel connector	Not used.
4	J7 keyboard connector	Connects keyboard to LCD.
5	AC/DC connector	When required, receptacle for AC/DC adapter.
6	Power on/off switch	Toggle switch to turn computer on or off.
7	Battery compartment	Compartment for internal batteries.
8	Chassis ground	Not used.
9	Antenna connector	Not used.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-4. GENERAL.

Preventive maintenance is performed to assure reliable operation and maximum service life. The purpose of the PMCS table is to provide a list of preventive maintenance checks and services and the intervals at which they must be performed. The purpose of the service intervals is to assure that necessary maintenance procedures are performed to prevent equipment failure and ensure continued serviceability. If equipment is not able to perform the mission, it will be reported to unit maintenance as not fully mission capable. As maintenance is performed, keep in mind all applicable WARNINGS and CAUTIONS.

Perform PMCS as required. Designated intervals are for usual operating conditions. PMCS must be performed more frequently when operating in unusual conditions, and before and after equipment storage.

If your equipment fails to operate, troubleshoot with proper equipment. Report any deficiencies, using the applicable forms, to unit maintenance.

Table 2-4 contains all scheduled maintenance for the MBC and associated equipment. While performing designated PMCS, keep in mind the following:

   a.   Storage. When the MBC is shelved or in long term storage, it requires a monthly PMCS check. Remove battery during storage.

   b.   Inspect Hardware. Check case, keyboard, LCD, and connectors. Report any missing or damaged items to next level of maintenance. Check on a monthly basis.

   c.   Inspect Cabling. Check cables and connectors for cracked or broken insulation. Also look for bare wires, and loose or broken connections. Tighten loose connections. Report other problems to next level of maintenance. Check on a monthly basis.

2-5. PMCS PROCEDURES.

Column listings are explained below.

   a.   Item No. Column. Checks and services are numbered in the order of normal performance.

   b.   Interval Column. BEFORE procedures must be done before you operate the equipment. DURING procedures must be done while you operate or use the equipment. AFTER procedures must be done after you operate the equipment. MONTHLY procedures must be done at least once per month.

   c.   Item To Be Checked or Serviced Column. Identifies the item to be checked or serviced.

   d.   Procedure Column. Describes the items and their checks, services, or other needs.

   e.   Not Fully Mission Capable If: Column. Lists conditions which make the computer unfit and not ready or available for use, because it is not able to fulfill its primary mission.

INITIAL SETUP

Materials/Parts
   General purpose lubricating oil (GPL) (item 7, Appendix F)
   Lens paper (item 8, Appendix F)
   Silicone compound (item 11, Appendix F)
   Soft bristle brush (item 2, Appendix F)
   Wiping rags (item 9, Appendix F)

2-5. PMCS PROCEDURES (cont).

Table 2-4. Preventive Maintenance Checks and Services.
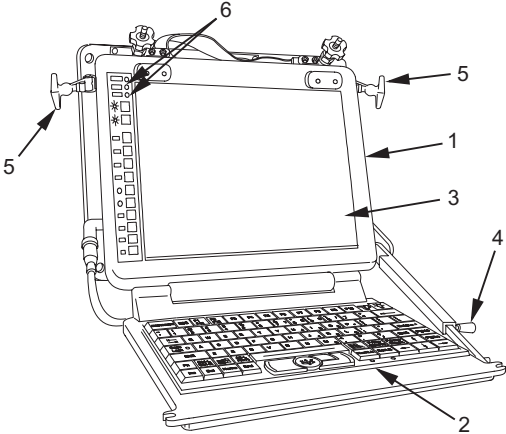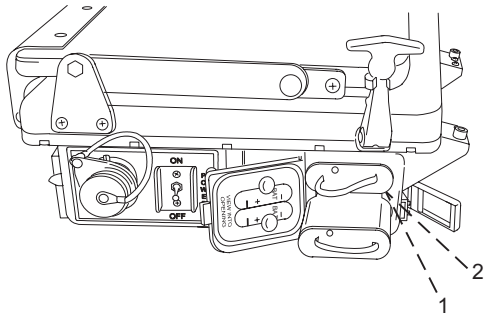
Item No.	Interval	Item To Be Checked or Serviced	Procedure	Not Fully Mission Capable If:
1	BEFORE/ DURING/ AFTER	MBC Case, Keypad, LCD	**CAUTION** To prevent equipment damage, do not use any petroleum-based cleaning products on the keypad. Inspect the case exterior (1), keypad surface and hinge points (2), and LCD (3) for condensation, dirt, oil, grease, and fingerprints, and for missing or damaged parts. Clean as necessary. Lubricate hinge points of case as necessary. Inspect MBC case for dents, cracks, holes, or corrosion. Inspect keypad hinge points and keypad surface for serviceability. Inspect LCD for cracks, chips, and other damage. Inspect arm assembly (4) for freedom of movement, corroded or stripped threads, and ability to secure keypad. Clean and lubricate as necessary.	Keypad and/or LCD are incapable of being read or operated due to condensation, dirt, oil, grease, or fingerprints. Parts are missing or damaged. Case exterior is dented, cracked, or corroded to the extent that it is not capable of providing environ-mental protection to interior circuitry. Keypad hinge points and/or keypad surface are not serviceable. LCD is damaged to the point of being unusable. Arm assembly prevents access to keypad.

Table 2-4. Preventive Maintenance Checks and Services (cont).

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Not Fully Mission Capable If:
2	BEFORE/ MONTHLY	MBC Battery and Battery Compartment	Inspect rubber fasteners (5) for cracks, tears, and brittleness. Inspect for ability to secure keypad. Clean as necessary. **CAUTION** Flashing battery indicator lights indicate overheating. Immediate removal of batteries is required. Observe BTRY1 and BTRY2 indicator lights (6). Ensure batteries are fully charged. **CAUTION** When the MBC is shelved or in long term storage, a monthly PMCS check is required. Remove batteries during storage. Inspect battery terminals (1) and the battery compartment interior (2) for signs of damage, corrosion, irregularities, and evidence of cell leakage. Inspect for dirt, oil, and grease. Clean as necessary. Replace battery, if necessary. 	Keypad cannot be accessed for use. Batteries are not charged. Battery compartment shows signs of ir-regularities, damage, or cell leakage. Ter-minals are corroded or damaged.

2-5. PMCS PROCEDURES (cont).

Table 2-4. Preventive Maintenance Checks and Services (cont).
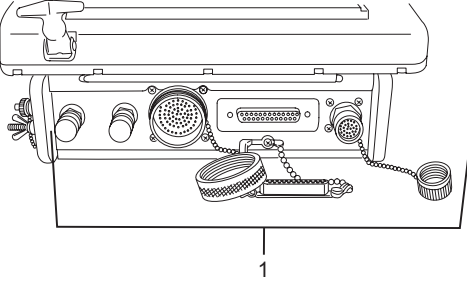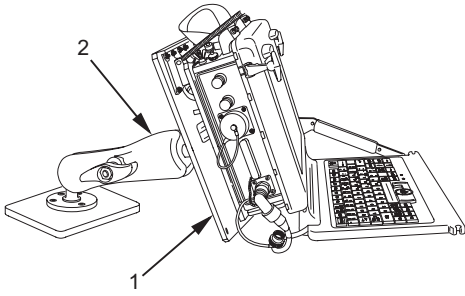
Item No.	Interval	Item To Be Checked or Serviced	Procedure	Not Fully Mission Capable If:
3	BEFORE	MBC Battery Compartment Access Cover	Inspect access cover (1) for good fit and environmental seal. 	Access cover is damaged to the extent that it is not capable of providing environmental protection for the batteries.
4	BEFORE/ AFTER	MBC Connectors and Covers	Inspect all connectors (1) for dirt, oil, and grease. Clean as necessary. Look for damaged, broken, bent, missing, or corroded pins. Inspect connector covers for good fit, rubber material for cracks and tears, and connector cover lanyards for tears, cracks, or breaks. 	MBC connectors are damaged, broken, bent, or missing, or have severely corroded pins.
5	BEFORE/ DURING	Computer Mounting Bracket, Arm, and Mounting Plates (M577/M1064 Installation)	Inspect computer mounting bracket (1) for cracks, breaks, or missing hardware. Inspect arm (2) for freedom of movement and supportability.	Computer mounting bracket and/or arm are not capable of supporting MBC.

Table 2-4. Preventive Maintenance Checks and Services (cont).

M577

M1064

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Not Fully Mission Capable If:
6	BEFORE/ DURING/ AFTER/ MONTHLY	MBC Interface Cables (Power and Communication)	Inspect each cable for torn, frayed, or cut insulation, and/or exposed wiring. Inspect cable connectors for damaged, broken, missing, or worn pins. Inspect connector shells for cracks and visible damage. Inspect for dirt, oil, and grease. Clean as necessary. Check that connectors are secure.	Cables have torn, frayed, or cut insulation, and/or exposed wiring to the point of being unserviceable. Cable connectors are damaged, broken, or missing, or have badly worn pins. Connector shells exhibit visible damage. Connectors are not secured.

2-5. PMCS PROCEDURES (cont).

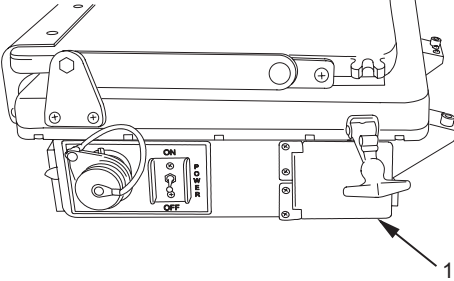Table 2-4. Preventive Maintenance Checks and Services (cont).

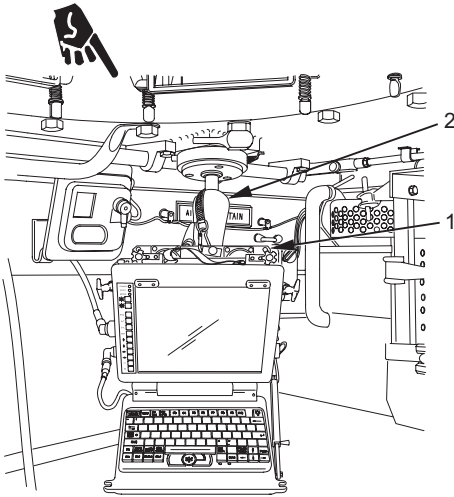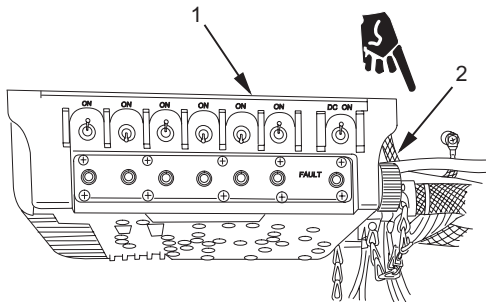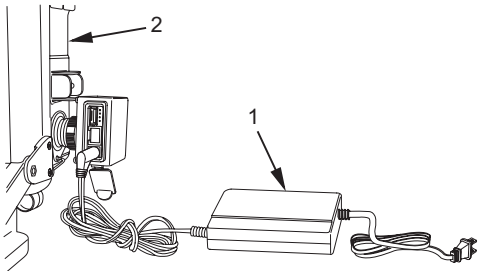| Item No.	Interval	Item To Be Checked or Serviced	Procedure	Not Fully Mission Capable If:
7	BEFORE/ DURING	Power Distribution Assembly (PDA)	**CAUTION** Steady illumination of FAULT light indicates overheating of PDA. Replacement of PDA is necessary. Inspect PDA (1) for signs of damage and/or corrosion. Inspect cable connectors for damaged, broken, missing, or worn pins. Inspect switches and indicators for serviceability. Inspect for missing or damaged dust caps. Inspect for dirt, oil, and grease. Clean as necessary. Check that grounding strap (2) is present, is serviceable, and is securely fastened to PDA (1) and roadside wall. 	Cable connectors are damaged, broken, or missing, or have badly worn pins. Switches and indicators are not operative. Grounding strap is missing or unserviceable.
8	BEFORE	MBC Power-On Self Test (POST)	Upon power-up of MBC, observe POST until prompt box appears.	MBC fails POST. Prompt box fails to appear.

Table 2-4. Preventive Maintenance Checks and Services (cont).

Item No.	Interval	Item To Be Checked or Serviced	Procedure	Not Fully Mission Capable If:
9	MONTHLY	AC/DC Adapter	Check AC/DC adapter (1) for ability to power computer (2). 	AC/DC adapter is unable to power computer.
10	MONTHLY	Soft Carrying Case	Inspect for dirt, oil, and grease. Clean as necessary. Inspect case exterior for tears, holes, or abrasions. Inspect shoulder straps, case straps, and fasteners for security and serviceability.	Case is damaged to the point of being incapable of providing protection for the MBC.

Section III. OPERATION UNDER USUAL CONDITIONS

2-6. PREPARATION FOR USE OR STORAGE.

This task covers:

    a. Installation   **b.** Removal

INITIAL SETUP

Materials/Parts
    Soft carrying case (item 3, Appendix D (Basic Issue Items))

INSTALLATION

NOTE

If required by unit standard operating procedure, the operator is authorized to install the computers in the vehicle.

Perform steps 1 through 5 prior to mission if MBC computers are not in place in the Fire Direction Center (FDC) or M1064.

1.   Obtain computers from secured place in accordance with standard operating procedures (SOP). If necessary, remove dust protective cap (0.1) and connect keyboard cable (0.2).

2-6. PREPARATION FOR USE OR STORAGE (cont).
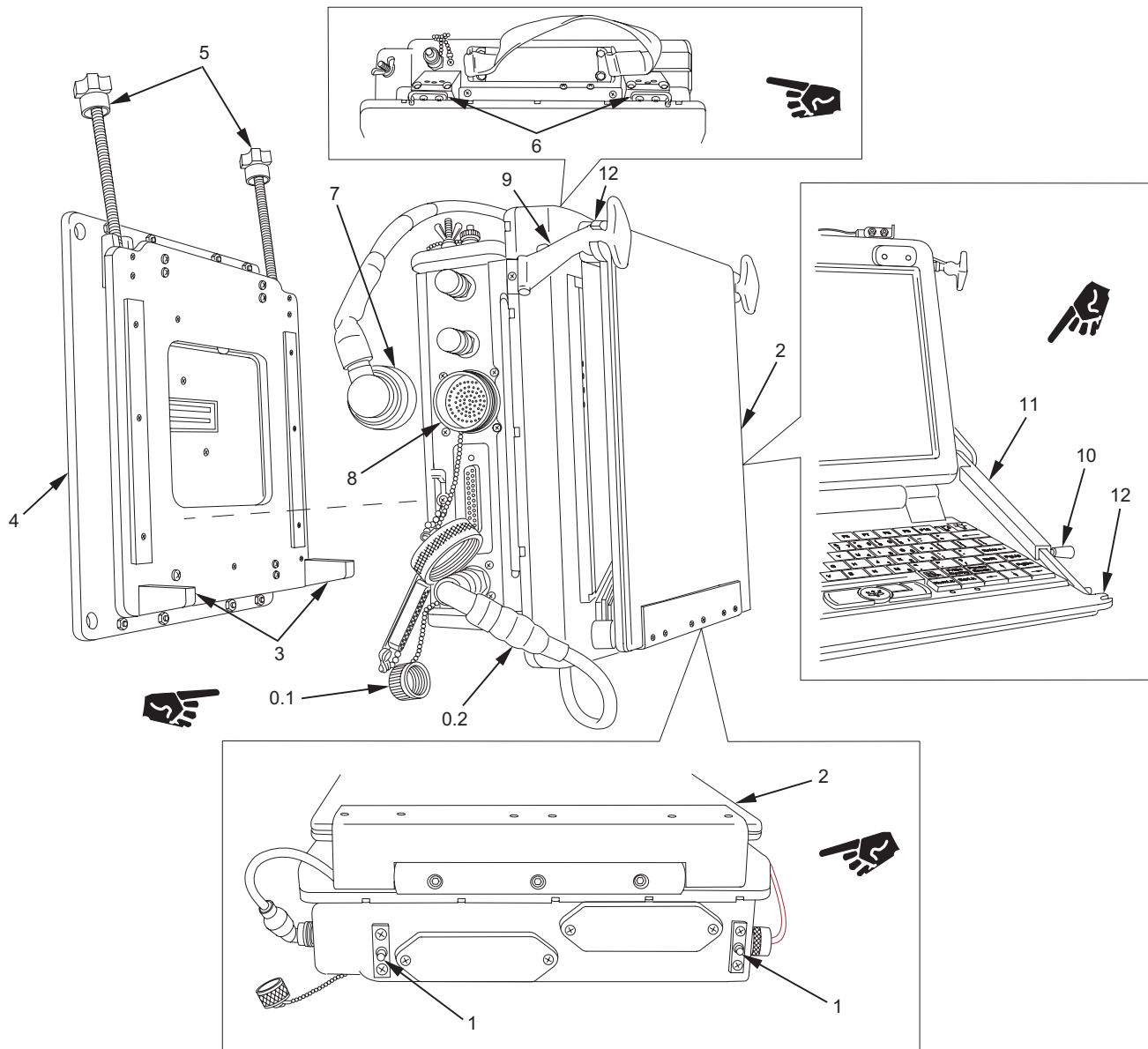
WARNING

Ensure power is turned off at power distribution assembly (PDA) before computers are installed.

CAUTION

To prevent equipment damage, do not handle computer by cable connecting keyboard to display area.

2.   Align two guide pins (1) of computer (2) with holes in two guide pin receptacles (3) of computer mounting bracket (4). Install computer on computer mounting bracket.

3. Align two retainer assemblies (5) with two locking fixtures (6) on computer (2). Tighten to secure computer.

NOTE

(M577 only) The primary computer, on the right side, is connected for digital and voice messaging by the power/communication cable from PDA connector J3. The secondary computer, on the left side, is connected only for voice messaging by the power cable from PDA connector J1.

4. Connect cable connector (7) to J1 connector (8) on computer (2).

5. Release rubber fastener (9) on each side of computer (2) and pull keyboard down and away from computer display area.

6. Place spring-loaded latch (10) on arm assembly (11) to secure keyboard at desired position.

7. If computer (2) is installed in the vehicle during travel, release spring-loaded latch (10) and fold keyboard against display area. Pull two rubber fasteners (9) into two U-shaped extensions (12) to secure keyboard.

8. (M577 only) Rest computer mounting bracket (4) on table top to lessen vibration and hand tighten ram mount.

NOTE

Step 9 applies to use of computer with AC/DC power supply. This is used for classroom environment or for charging of internal batteries with use of alternating current (AC) power.
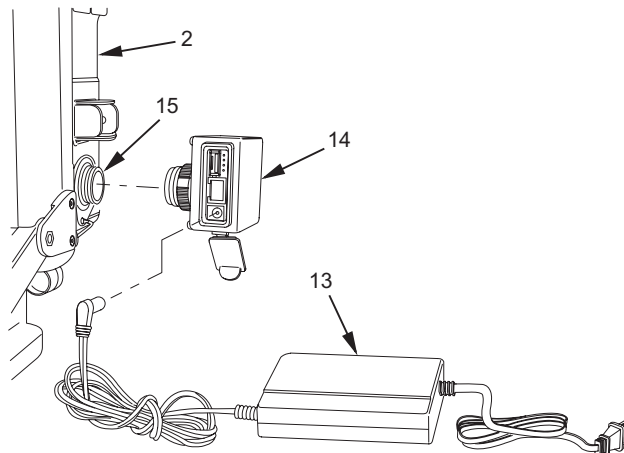
9. Install AC/DC power supply (13) and connector block (14) to J6 connector (15) on computer (2).

2-6. PREPARATION FOR USE OR STORAGE (cont).

REMOVAL

NOTE

Step 0.1 applies to use of computer with AC/DC power supply.
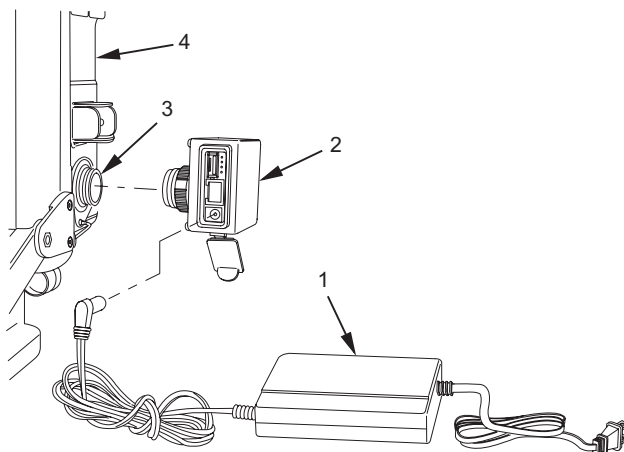
0.1. Remove AC/DC power supply (1) and connector block (2) from J6 connector (3) on computer (4).

NOTE

If required by unit standard operating procedure, the operator is authorized to remove the computers from the vehicle for tactical missions or storage.

1. Release spring-loaded latch (5) on arm assembly (6) and fold keyboard against display area. Pull two rubber fasteners (7) into two U-shaped extensions (8) to secure keyboard.

WARNING

Ensure power is turned off at power distribution assembly (PDA) before computers are removed.

CAUTION

To prevent equipment damage, do not handle computer by cable connecting keyboard to display area.

2. Disconnect cable connector (9) from J1 connector (10) on computer (4).

3. Loosen knobs on two retainer assemblies (11) and release from two locking fixtures (12).

4. Lift computer (4) and remove two guide pins (13) from two guide pin receptacles (14) of computer mounting bracket (15).

CAUTION

To avoid damage to computer keyboard cable connector, disconnect cable and install dust protective cap prior to placement of computer into carrying case.

5. Place computer (4) in soft carrying case (item 3, Appendix D) for transport during a tactical mission or for unit storage.
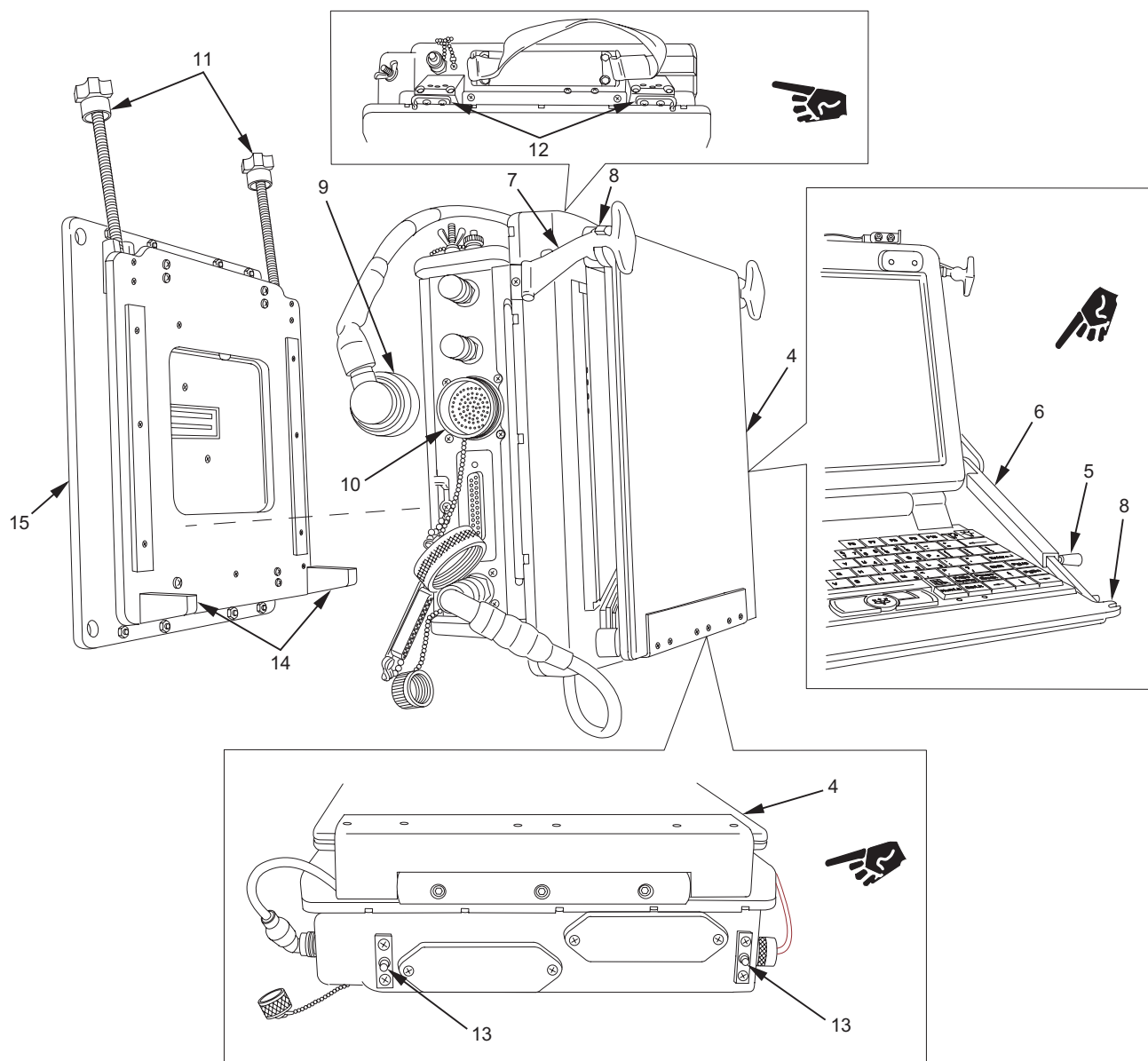
2-7. BATTERY ONLY OPERATING PROCEDURES.
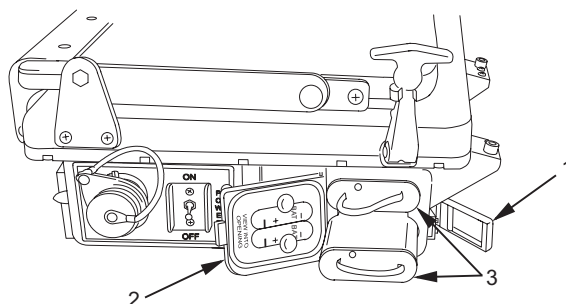
WARNING

Ensure power is turned off at power distribution assembly (PDA) before batteries are installed.

NOTE

Ensure that both batteries are fully charged before installation. Three hours of operation can be expected, if fully charged batteries are used. Refer to paragraph 3-5.

Battery 2 is on the top and Battery 1 is on the bottom.

1. Lift door latch (1) and open battery access door (2). Swing battery access door to left.

NOTE

Prior to installation of new battery, ensure that protective cap is removed. Retain protective cap for use when battery is removed from mortar ballistic computer.

2. Insert batteries (3) into battery compartment with the battery fuel gauge (4) visible on top and the pull-tab (5) facing out. Close battery access door (2) and secure with door latch (1).
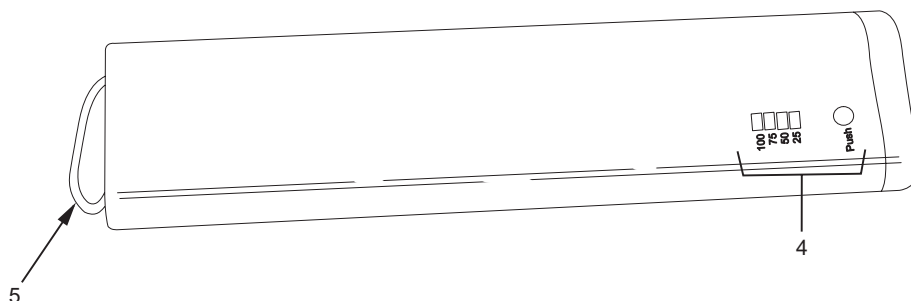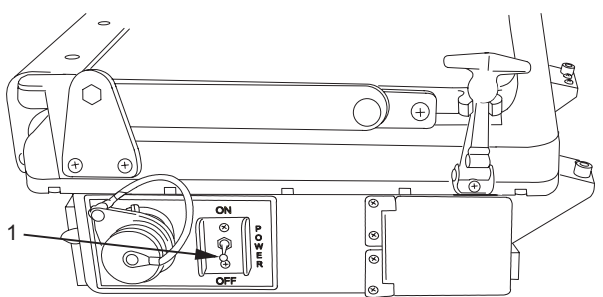
3. Operate MBC as normal.

2-8. DAILY CHECKS AND SELF-TEST.

Refer to Table 2-5 for daily checks and self-test procedures.

Table 2-5. Daily Checks and Self-Test.

Step	Observe
	CAUTION A constant 12 VDC is present on the connector pins whenever the batteries are installed. To prevent accidental shorting of pins and depletion of batteries, ensure that connectors are capped when not in use.
1. MBC TURN ON. a. Check input power connection.	a. Batteries are installed in battery compartment. Power cable is connected to computer.
b. Turn PDA DC ON switch to ON.	b. Green LED lights.
c. Turn PDA CI switch to ON.	c. Green LED lights.
d. Turn toggle switch (1) to ON. In M577 only, first turn primary computer to ON.	d. POWER indicator lights. BTRY1 and BTRY2 indicators light.
e. Observe POST.	e. Primary MBC passes POST.
f. Turn toggle switch (1) to ON on secondary MBC.	f. POWER indicator lights. BTRY1 and BTRY2 indicators light.
g. Observe POST.	g. Secondary MBC passes POST.

2-9. MBC OPERATING PROCEDURES (POWER ON - POWER OFF).

Refer to Table 2-6 for MBC operating procedures.

CAUTION

To ensure maximum reliability of the MBC, keep connector and PCMCIA access doors closed and keypad folded against the LCD display when not in use.

NOTE

When radio hookup is necessary, refer to Appendix H for setup procedures.

Table 2-6. MBC Operating Procedures.
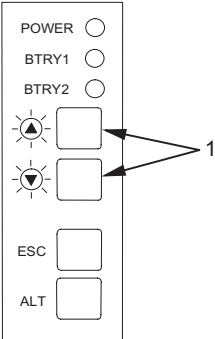
Step	Observe
	CAUTION A constant 12 VDC is present on the connector pins whenever the batteries are installed and when vehicle power is used. To prevent accidental shorting of pins and depletion of batteries, ensure that connectors are capped when not in use.
1. TURN ON MBC.	
a. Perform MBC turn-on (press toggle switch toward operator) and observe POST.	a. POWER indicator lights. MBC passes POST. MBC BANNER screen appears. If test fails, see Operator Troubleshooting Procedures.
2. ADJUSTING DISPLAY.	
a. Press buttons (1) on left side of liquid crystal display (LCD). Pressing buttons will increase brightness or decrease brightness. 	a. Screen brightness increases or decreases as needed.
3. DIAGNOSTICS.	3. See Operator Troubleshooting Procedures.

Table 2-6. MBC Operating Procedures (cont).

Step	Observe
4. TURN-OFF MBC. **NOTE** There are only two correct methods to power off the MBC. Follow either method (a or b) below. Do not just switch off power at the MBC. This is an uncontrolled shut down and may cause startup problems. a. Press "Ctrl" (control) and "End" keys simultaneously to save entered data and to power off. Turn MBC power switch OFF. b. Press "Ctrl" and "Del" (delete) keys simultaneously to delete saved data and to power off. Turn MBC power switch OFF.	 a. "SAVING DATA TO DISK" operator display message is momentarily displayed. Then Windows will display: SHUTDOWN COMPUTER IT IS NOW SAFE TO TURN OFF YOUR COMPUTER. RESTART LCD display goes blank. POWER indicator goes off. MBC shuts off. b. "DELETE MEMORY AND SHUTDOWN? YES NO" F3 F4 operator message is displayed. Press YES (F3). Then Windows will display: SHUTDOWN COMPUTER IT IS NOW SAFE TO TURN OFF YOUR COMPUTER. RESTART LCD display goes blank. POWER indicator goes off. MBC shuts off.

2-10. INITIALIZATION AND SETUP FOR MISSIONS.

SELF TEST / POWER UP

1. Turn ON/OFF Switch. Menu should show the following:

MESSAGES - 00   MSGS NOT REVIEWED – 00   FO COMMANDS - 00

MORTAR BALLISTIC COMPUTER

VERSION X.X
DATE (SUBJECT TO CHANGE ACCORDING TO VERSION)

TACOM LIFE CYCLE SOFTWARE ENGINEERING CENTER

CONTINUE

F4

2. Press CONTINUE (F4).

NOTE

If communication data was previously loaded, message "ENABLING DIGITAL
COMMUNICATION, PLEASE WAIT..." will appear at top of screen. Delay action until message
disappears. If error occurs, error message will appear at bottom of screen. See troubleshooting
procedures (paragraph 3-2) to correct errors.

3. If an error is indicated, refer to operator troubleshooting. See paragraph 3-2.

4. If no error is indicated, press CONTINUE (F4).

INITIALIZATION

NOTE

As fire missions progress, messages may be received to alert the operator to problems in
completion of the mission. Refer to Appendix I for operator alert and error messages.

1. The SETUP screen will appear. Begin to enter the SETUP data.

2-10. INITIALIZATION AND SETUP FOR MISSIONS (cont).

SETUP

TIME-OUT (SECONDS)	15	MINIMUM TARGET NO	0000
ALARM	ON	MAXIMUM TARGET NO	9999
VIDEO MODE	NORMAL	MINIMUM EASTING	100000
DATE	_ _ _ _ _ _ _ _	MINIMUM NORTHING	0000000
TIME	_ _ _ _ _ _	LATITUDE	+00
TGT NUMBER PREFIX	_ _	GRID DECLINATION	E_ _ _

SELECT	USE ALL		CANCEL
F1	F2		F4

NOTE

NORMAL video mode is white characters on black background (optimum mode). REVERSE
video mode is black characters on white background.

2. If change to the video mode is desired, highlight VIDEO MODE. Press SELECT (F1) to change from
NORMAL to REVERSE mode. Press YES (F3) and select USE ALL (F2).

BASIC DATA SETUP FOR MBC

1. Enter the following SET UP data.

2. After entering the information needed, always press the function (F) keys to allow the computer to properly
save the data.

SETUP

TIME-OUT (SECONDS)	60	MINIMUM TARGET NO	0400
ALARM	ON	MAXIMUM TARGET NO	0900
VIDEO MODE	NORMAL	MINIMUM EASTING	689000
DATE	01 01 2001	MINIMUM NORTHING	3570000
TIME	00 00	LATITUDE	+31
TGT NUMBER PREFIX	CD	GRID DECLINATION	E020

SELECT	USE ALL	SET CLOCK	CANCEL
F1	F2	F3	F4

3. After all data has been entered, press USE ALL (F2).

4. Select SECTION A from the SECTION SELECTION menu by using arrow keys to highlight section.

SECTION SELECTION

SECTION A

SECTION B

SECTION C

SELECT		CANCEL
F1		F4

5. Then press SELECT (F1).

6. The WEAPON SYSTEM SELECTION menu will appear.

WEAPON SYSTEM SELECTION

60 MM/M19
60 MM/M224
81 MM/M29A1
81 MM/M252
81 MM/M303
107 MM/M30
120 MM/M120

SELECT		CANCEL
F1		F4

7. Highlight 120 MM/M120 from WEAPON SYSTEM SELECTION menu and press SELECT (F1). The SECTION DATA menu will now appear.

2-10. INITIALIZATION AND SETUP FOR MISSIONS (cont).

SECTION DATA

SECTION ID	A
WEAPON SYSTEM	120 MM/M120
MOUNTING	**CARRIER**
LOCATION METHOD	BASE PIECE
SECTION AZIMUTH	0500
SECTION DEFLECTION	2800

SELECT	USE ALL	CANCEL
F1	F2	F4

8. Highlight MOUNTING and press SELECT (F1). Change GROUND to CARRIER. Highlight LOCATION METHOD   BASE PIECE and press SELECT (F1). Select NO (F4) option from resulting question: "CHANGE LOC METHOD TO INDEPENDENT?"

9. Select SECTION AZIMUTH from the menu.

10. Enter SECTION AZIMUTH data "0500". Press ACCEPT (F2).

11. SECTION DEFLECTION data "2800" will appear.

12. SECTION DEFLECTION will default to 2800, if no change is needed. Select USE ALL (F2).

13. The DEFINED WEAPON menu will appear.

14. NEW WEAPON will be highlighted on DEFINED WEAPON menu. Press SELECT (F1).

DEFINED WEAPON

NEW WEAPON

SELECT	FINISHED	CANCEL
F1	F2	F4

15. Highlight WEAPON A2 (Base Gun) from UNDEFINED WEAPON menu using arrow keys. Then press SELECT (F1).

UNDEFINED WEAPON

WEAPON A1
WEAPON A2
WEAPON A3
WEAPON A4
WEAPON A5
WEAPON A6

SELECT		CANCEL
F1		F4

NOTE

CLEAR (F3) deletes data on working line and allows for correction.

16. WEAPON DATA (BASE PIECE) menu will now appear. Enter the following data into this menu. As data is entered, press ACCEPT (F2) or ENTER after each entry.

WEAPON DATA (BASE PIECE)

BASE PIECE WEAPON ID	A2
EASTING	11800
NORTHING	89300
ALTITUDE	+0150

SELECT	USE ALL		CANCEL
F1	F2		F4

17. Press USE ALL (F2) when finished with data entry.

18. DEFINED WEAPON menu will now appear with WEAPON A2 entered in the system.

19. Highlight NEW WEAPON and press SELECT (F1).

DEFINED WEAPON

NEW WEAPON
WEAPON A2

SELECT	FINISHED		CANCEL
F1	F2		F4

2-10. INITIALIZATION AND SETUP FOR MISSIONS (cont).

20.   UNDEFINED WEAPON menu appears.

NOTE

Weapon list will now appear without base gun WEAPON A2.

UNDEFINED WEAPON

WEAPON A1
WEAPON A3
WEAPON A4
WEAPON A5
WEAPON A6

SELECT	CANCEL
F1	F4

21.   Highlight WEAPON A1 and press SELECT (F1). WEAPON DATA (ALTERNATE PIECE) menu will now appear.

22.   Enter the following data:

WEAPON DATA (ALTERNATE PIECE)

ALTERNATE PIECE WEAPON ID	**A1**
DIRECTION FROM BASE PIECE	2220
DISTANCE FROM BASE PIECE	075

ACCEPT	CLEAR	CANCEL
F2	F3	F4

23.   Press ACCEPT (F2) after each entry and then press USE ALL (F2) when finished.

24.   DEFINED WEAPON menu will reappear with the following information. Highlight NEW WEAPON and press SELECT (F1).

DEFINED WEAPON

NEW WEAPON
WEAPON A1
WEAPON A2

SELECT	FINISHED	CANCEL
F1	F2	F4

25. The UNDEFINED WEAPON menu will reappear as in step 20. Select WEAPON A3. The WEAPON DATA (ALTERNATE PIECE) menu will appear. Enter the following data.

WEAPON DATA (ALTERNATE PIECE)

ALTERNATE PIECE WEAPON ID **A3**
DIRECTION FROM BASE PIECE 5520
DISTANCE FROM BASE PIECE 075

ACCEPT	CLEAR	CANCEL
F2	F3	F4

26. Press ACCEPT (F2) after each entry. When finished with data entry, press USE ALL (F2).

NOTE

To place WEAPON A4 repeat steps 24 through 26 entering DIRECTION 5520, DISTANCE +150.
If additional weapons are required, follow steps 24 through 26.

27. When all weapons have been placed from DEFINED WEAPON menu, press FINISHED (F2).

28. AMMUNITION PRE-SELECT 120 MM/M120 screen will now appear. Enter the following data (PROPELLANT TEMPERATURE +075). Press ACCEPT (F2).

AMMUNITION PRE-SELECT 120 MM/M120

PROPELLANT TEMPERATURE (F)   +075

HE - HIGH EXPLOSIVE   M934
WP- WHITE PHOSPHORUS   M929
ILL - ILLUMINATION   M930
IR - IR ILLUMINATION   M983

TRN - TRAINING   M931

SELECT	USE ALL	CANCEL
F1	F2	F4

29. Highlight HE - HIGH EXPLOSIVE and press SELECT (F1). HE - HIGH EXPLOSIVE 120 MM/M120 screen appears. Highlight M934A1 and press SELECT (F1).

HE - HIGH EXPLOSIVE 120 MM/M120

M933
M934
M934A1

SELECT	CANCEL
F1	F4

2-10. INITIALIZATION AND SETUP FOR MISSIONS (cont).

30. When the propellant temperature and ammunition data are correct, select USE ALL (F2). AMMO INVENTORY 120 MM/M120 screen appears.

<div align="center">

AMMO INVENTORY 120 MM/M120

HE - HIGH EXPLOSIVE
WP - WHITE PHOSPHORUS
ILL - ILLUMINATION
IR - IR ILLUMINATION
TRN - TRAINING

</div>

SELECT	FINISHED		CANCEL
F1	F2		F4

31. Highlight HE-HIGH EXPLOSIVE on the AMMO INVENTORY 120 MM/M120 screen and press SELECT (F1). AMMO INVENTORY (HE) screen appears.

<div align="center">

NOTE

</div>

There will be 100 rounds of M934A1 HE ammunition for this mission sample. The AMMO LOW WARNING LIMIT PER ROUND will be 99.

<div align="center">

AMMO INVENTORY (HE)

</div>

PROJECTILE   QUANTITY

M933
M934
M934A1   100

AMMO LOW WARNING LIMIT PER ROUND   99

SELECT	USE ALL		CANCEL
F1	F2		F4

32. Highlight M934A1 and press SELECT (F1). Enter in the ammunition available (100 M934A1) and press USE ALL (F2) to accept. If required, page down to change AMMO LOW WARNING LIMIT PER ROUND. Change the WARNING to 99 for this example. If not required, press USE ALL (F2). AMMO INVENTORY 120 MM/M120 screen will reappear. When data entry is completed, press FINISHED (F2).

33. The MBC MAIN MENU will now appear.

MBC MAIN MENU

SET UP DATA	MET SELECTION
SECTION DATA	SAFETY GEOMETRY
FORWARD OBSERVERS	REGISTRATION DATA
KNOWN POINTS	SURVEY MENU
TARGET LOCATIONS	COMMUNICATION MENU
FIRE MISSIONS	

SELECT
F1

34. Highlight FORWARD OBSERVERS and press SELECT (F1). FORWARD OBSERVER (FO) CALL menu will appear.

FORWARD OBSERVER (FO) CALL

NEW FO

SELECT		FINISHED		CANCEL
F1		F2		F4

35. Press SELECT (F1) for NEW FO and FORWARD OBSERVER DATA menu will appear. Enter the following data into this menu.

FORWARD OBSERVER DATA

FORWARD OBSERVER CALL	W012
NETWORK ID	W
FORWARD OBSERVER NUMBER	12
SUBSCRIBER TYPE	FO
DEVICE TYPE	UNKNOWN
FO LOCATION	
EASTING	11000
NORTHING	89000
ALTITUDE	+0150

ACCEPT		CLEAR		CANCEL
F2		F3		F4

36. Enter in the FO Location; when all data is entered, select USE ALL (F2). The FORWARD OBSERVER (FO) CALL menu reappears; press FINISHED (F2). The MBC MAIN MENU will appear.

2-11. GRID MISSION.

1. A fire mission is received; highlight FIRE MISSIONS from MBC MAIN MENU below and press SELECT (F1).

MBC MAIN MENU

SET UP DATA	MET SELECTION
SECTION DATA	SAFETY GEOMETRY
FORWARD OBSERVERS	REGISTRATION DATA
KNOWN POINTS	SURVEY MENU
TARGET LOCATIONS	COMMUNICATION MENU
FIRE MISSIONS	

```
SELECT
```
F1

2. FIRE MISSIONS MENU will now appear. Highlight GRID MISSION and press SELECT (F1).

FIRE MISSIONS MENU

GRID MISSION
SHIFT MISSION
POLAR MISSION
LASER POLAR MISSION
FINAL PROTECTIVE FIRE
SELECT ACTIVE MISSION
END OF MISSION (EOM)

```
SELECT                                                MAIN MENU
```
F1   F4

3. GRID MISSION menu will now appear. Highlight FO CALL and press SELECT (F1).

GRID MISSION

MISSION NUMBER	1
TARGET ID	CD0400
FO CALL	NONE
REFERENCE DIRECTION	GUN-TGT

TARGET LOCATION:	EASTING	_ _ _ _ _
	NORTHING	_ _ _ _ _
	ALTITUDE	_ _ _ _ _

```
SELECT          USE ALL                        CANCEL
```
F1   F2   F4

4. ACTIVE FORWARD OBSERVERS menu appears. Highlight FO W012 and press SELECT (F1). ▮

ACTIVE FORWARD OBSERVERS

NONE
W012

SELECT	CANCEL
F1	F4

5. GRID MISSION screen reappears with REFERENCE DIRECTION highlighted. Press SELECT (F1); the REFERENCE DIRECTION menu appears.

REFERENCE DIRECTION

GUN-TGT
FO-TGT
OTHER

SELECT	CANCEL
F1	F4

6. Select FO-TGT; press SELECT (F1). The GRID MISSION screen (step 3) appears with EASTING highlighted. Put in the grid sent in the CALL FOR FIRE; press ACCEPT (F2) after each entry. The menu will reappear. Press USE ALL (F2) when data entry is complete.

GRID MISSION

MISSION NUMBER   1
TARGET ID   CD0400
FO CALL   W012
REFERENCE DIRECTION   FO-TGT

TARGET LOCATION: EASTING   15700
                              NORTHING   93500
                              ALTITUDE   +0150

SELECT	USE ALL	CANCEL
F1	F2	F4

2-11. GRID MISSION (cont).

7. BASE GUN SELECTION menu will now appear. Highlight base gun A2 and press SELECT (F1).

<div align="center">

BASE GUN SELECTION

A1
A2
A3
A4

</div>

SELECT	CANCEL
F1	F4

8. MISSION WEAPON/AMMO/SHEAF INFORMATION menu will appear. To change the information, select BASE GUN, METHOD OF CONTROL, AMMO CATEGORY, FUZE, CHARGE, and ROUNDS PER GUN.

<div align="center">

MISSION WEAPON/AMMO/SHEAF INFORMATION

</div>

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

SELECT	USE ALL	CANCEL
F1	F2	F4

9. When all data has been entered, press USE ALL (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION menu will reappear with the following question at the bottom: COMPUTE GUN ORDERS? Press YES (F3).

10. FIRE DATA menu will now appear summarizing all data with resulting calculations.

<div align="center">

FIRE DATA

</div>

MISSION 1		WEAPON	A2
TARGET CD0400		DEFLECTION	2538
HE M934A1 / MO		ELEVATION	1118
ADJUST FIRE		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	51.5

END
F4

11. After review of FIRE DATA, press END (F4).

12. CURRENT MISSION MENU will appear. Highlight REVIEW SAFETY DATA and press SELECT (F1).

CURRENT MISSION MENU

ADJUST AUF   REGISTRATION
ENTER FFE PHASE   REPLOT
EDIT/REVIEW MISSION DATA   MESSAGE QUEUE
REVIEW FIRE DATA   SEND MESSAGE MENU
REVIEW SAFETY DATA   SETUP SHOT/SPLASH
COMPUTE SOLUTION   END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

13. SAFETY DATA menu will appear with the following data displayed. After review of data, press END (F4).

SAFETY DATA

MISSION 1	WEAPON	A2
TARGET CD0400	RANGE TO TARGET	5731
HE M934A1 / MO	GUN-TGT AZIMUTH	0762
ADJUST FIRE	BP EASTING	15700
PARALLEL SHEAF	BP NORTHING	93500
ANGLE T 0060	MAX ORDINATE	+3368
	TIME OF FLIGHT	51.5

END
F4

14. CURRENT MISSION MENU will now reappear. Press SHOT (F2). This allows the computer to maintain its ammo inventory. SPLASH appears on the screen approximately ten seconds before the splash occurs. To proceed with mission, press CONTINUE (F4). CURRENT MISSION MENU appears with ADJUST AUF highlighted.

NOTE

The FORWARD OBSERVER W012 calls back a correction of DROP 050 FIRE FOR EFFECT. In order to enter the FFE phase with the MBC computer, it is necessary to make the correction in the ADJUST AUF menu first.

15. At the CURRENT MISSION MENU with ADJUST AUF highlighted, press SELECT (F1) to make the adjustment for the FFE.

2-11. GRID MISSION (cont).

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/ SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT	FM MENU
F1	F2	F4

16. ADJUST AUF ENTER/REVIEW menu appears. Highlight ENTER NEW GRID ADJUST DATA from menu. Press SELECT (F1).

ADJUST AUF ENTER/REVIEW

ENTER NEW GRID ADJUST DATA
ENTER NEW LASER ADJUST DATA
REVIEW DATA

SELECT	CANCEL
F1	F4

17. ADJUST AUF menu will appear. TARGET ID, REFERENCE DIRECTION, and REFERENCE AZIMUTH data menu lines will already be completed. DEVIATION RIGHT/LEFT, RANGE ADD/DROP, and VERTICAL DISPLACEMENT UP/DOWN can be changed. Enter the following data into this menu (DROP 050). After data has been entered, press ACCEPT (F2).

ADJUST AUF

TARGET ID	CD0400
REFERENCE DIRECTION	FO-TGT
REFERENCE AZIMUTH	0822
DEVIATION	RIGHT _ _ _
RANGE	DROP 050
VERTICAL DISPLACEMENT	UP _ _ _

SELECT	USE ALL	CANCEL
F1	F2	F4

18. After review of the data, press USE ALL (F2) and the FIRE DATA menu will appear.

FIRE DATA

MISSION 1	WEAPON	A2
TARGET CD0400	DEFLECTION	2539
HE M934A1 / MO	ELEVATION	1124
ADJUST FIRE	CHARGE	4
PARALLEL SHEAF	FUZE SETTING	0.0
	TIME OF FLIGHT	51.6

```
+-----------+
|    END    |
+-----------+
     F4
```

19. Record the Fire Data on DA Form 2399, Computer's Record. Press END (F4) to return to the CURRENT MISSION MENU.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/ SPLASH
COMPUTE SOLUTION	END OF MISSION

```
+-----------+    +-----------+              +-----------+
|  SELECT   |    |   SHOT    |              |  FM MENU  |
+-----------+    +-----------+              +-----------+
     F1               F2                         F4
```

20. Highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA menu will appear.

SAFETY DATA

MISSION 1	WEAPON	A2
TARGET CD0400	RANGE TO TARGET	5682
HE M934A1 / MO	GUN-TGT AZIMUTH	0762
ADJUST FIRE	BP EASTING	15664
PARALLEL SHEAF	BP NORTHING	93465
ANGLE T 0060	MAX ORDINATE	+3388
	TIME OF FLIGHT	51.6

```
+-----------+
|    END    |
+-----------+
     F4
```

21. Record the Safety Data on DA Form 2399, Computer's Record. On the SAFETY DATA menu, press END (F4). The CURRENT MISSION MENU appears.

2-11. GRID MISSION (cont).

CURRENT MISSION MENU

ADJUST AUF   REGISTRATION
ENTER FFE PHASE   REPLOT
EDIT/REVIEW MISSION DATA   MESSAGE QUEUE
REVIEW FIRE DATA   SEND MESSAGE MENU
REVIEW SAFETY DATA   SETUP SHOT/SPLASH
COMPUTE SOLUTION   END OF MISSION

SELECT		SHOT		FM MENU
F1		F2		F4

22. Highlight ENTER FFE PHASE and press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF
INFORMATION menu will appear.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN   A2   CHARGE   AUTO
WEAPON TYPE   120 MM/M120   SHEAF   PARALLEL
METHOD OF CONTROL   FIRE FOR EFFECT   APPLY REG CF   NO
ADDITIONAL WEAPONS   A1, A3, A4   MET   STANDARD
AMMO CATEGORY   HE (M934A1)   ROUNDS PER GUN   03
FUZE   MO

SELECT		USE ALL		CANCEL
F1		F2		F4

23. If data is correct, select USE ALL (F2). The question "COMPUTE GUN ORDERS?" will appear.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN   A2   CHARGE   AUTO
WEAPON TYPE   120 MM/M120   SHEAF   PARALLEL
METHOD OF CONTROL   FIRE FOR EFFECT   APPLY REG CF   NO
ADDITIONAL WEAPONS   A1, A3, A4   MET   STANDARD
AMMO CATEGORY   HE (M934A1)   ROUNDS PER GUN   03
FUZE   MO

COMPUTE GUN ORDERS?

YES		NO
F3		F4

24. Press YES (F3) to compute fire data. The FIRE DATA menu will appear with section firing data. To review
section fire data, select NEXT (F2).

FIRE DATA

MISSION 1		WEAPON	A2
TARGET CD0400		DEFLECTION	2539
HE M934A1 / MO		ELEVATION	1124
FIRE FOR EFFECT		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	51.6

PREVIOUS	NEXT	END
F1	F2	F4

25. After the data is reviewed, press END (F4). The CURRENT MISSION MENU will appear. Review Safety Data and press END (F4). CURRENT MISSION MENU reappears.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ADJUST SHEAF	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT	FM MENU
F1	F2	F4

26. Press SHOT (F2). Once SPLASH is observed, press CONTINUE (F4). CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ADJUST SHEAF	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT	FM MENU
F1	F2	F4

NOTE

The Forward Observer W012 sends End of Mission, target destroyed.

27. Highlight END OF MISSION and press SELECT (F1). END OF MISSION MENU appears.

2-11. GRID MISSION (cont).

NOTE

As shown in the "END OF MISSION MENU" below, there are four methods to end the mission. However, for the purpose of this sample mission, this TM is highlighting the "RECORD NON-SURVEYED TARGET" method.

END OF MISSION MENU

CURRENT MISSION 1

END WITHOUT SAVING
RECORD SURVEYED TARGET
RECORD NON-SURVEYED TARGET
RECORD AS FPF LINE

SELECT		CANCEL
F1		F4

28. To record as NON-SURVEYED TARGET, use the page up/down key to highlight RECORD NON-SURVEYED TARGET. Press SELECT (F1) and the TARGET/KNOWN POINT DATA menu will appear.

TARGET/KNOWN POINT DATA

KNOWN POINT ID	00
SAVED TARGET ID	CD0400
SURVEYED	NO
EASTING	15664
NORTHING	93465
ALTITUDE	+0150

SELECT	USE ALL		CANCEL
F1	F2		F4

29. Enter 00 in KNOWN POINT ID and, after data is reviewed, press USE ALL (F2). The CONFIRM ESTIMATE OF ROUNDS FIRED menu will appear.

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   013

SELECT	USE ALL	END
F1	F2	F4

30.   Press USE ALL (F2) and the menu will reappear with inventory at bottom of menu.

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   013

M934A1 INVENTORY LOW. 87 ROUNDS REMAIN   CONTINUE

F4

31.   Press CONTINUE (F4) and the computer returns to FIRE MISSIONS MENU.

NOTE

In order to continue the missions, save the target as a known point 00.

To clear the computer memory at any time, press the Ctrl and Del keys simultaneously and then press YES (F3).

To shutdown the computer but retain data, press the Ctrl and End keys simultaneously.

2-12. SHIFT MISSION.

In order to compute the firing data for a shift mission, a known point from which to shift, the Observer Target (OT) direction, and the lateral and range corrections from the known point are necessary.

Sample Shift Mission Objectives:

An initialized MBC computer; a call for fire (using shift from a known point as the method of target location); DA Form 2399, Computer's Record; and DA Form 2188-R, Data Sheet, are needed to perform the following:

- Compute data for a shift mission.

NOTE

The Grid mission in this manual must be completed prior to conducting this mission.

Fire Mission

J36
Shift Known Point 00
Troops crossing bridge
Direction 1900
Right 0500
Add 0400

---

1. The Forward Observer W012 sends the above fire request.

```
┌──────────────────────────────────────────────┐
│                                                │
│                 FDC ORDER                      │
│                                                │
│                                                │
│                    SEC                         │
│                  #2 GUN                        │
│                 1 ROUND                         │
│                   HEQ                          │
│                 3 ROUNDS                       │
│                   W/R                          │
│                                                │
│                                                │
└──────────────────────────────────────────────┘
```

2. Enter the fire request into the MBC computer using the MBC MAIN MENU and highlight FIRE MISSIONS. Then press SELECT (F1); the FIRE MISSIONS MENU is displayed.

<div align="center">

FIRE MISSIONS MENU

GRID MISSION
SHIFT MISSION
POLAR MISSION
LASER POLAR MISSION
FINAL PROTECTIVE FIRE
SELECT ACTIVE MISSION
END OF MISSION (EOM)

</div>

SELECT		MAIN MENU
F1		F4

3. Using the page up/down button, highlight SHIFT MISSION; then press SELECT (F1). The SHIFT MISSION menu now appears.

2-12. SHIFT MISSION (cont).

SHIFT MISSION

MISSION NUMBER   1
TARGET ID   CD0401
FO CALL   W012
KNOWN POINT ID   00
SAVED TARGET ID
REFERENCE DIRECTION   OTHER
REFERENCE AZIMUTH   1900
LATERAL DISTANCE   RIGHT 000
RANGE   ADD   000
VERTICAL DISTANCE   UP   000

SELECT	USE ALL		CANCEL
F1	F2		F4

4. From the SHIFT MISSION menu, highlight FO CALL and press SELECT (F1). At the FORWARD
    OBSERVERS screen, select W012 and press SELECT (F1). Highlight KNOWN POINT ID and press
    SELECT (F1). Select KNOWN POINT 00 and press SELECT (F1). Highlight REFERENCE DIRECTION
    and press SELECT (F1). Choose OTHER and press SELECT (F1). Enter 1900 in REFERENCE AZIMUTH.
    Then enter in the deviations from the FO (RIGHT 0500, ADD 0400**)** and press ACCEPT (F2) after each
    entry. When finished, press USE ALL (F2). The BASE GUN SELECTION screen will appear.

BASE GUN SELECTION

A1
A2
A3
A4

SELECT		CANCEL
F1		F4

5. Use the page up/down and highlight A2; press SELECT (F1). After selecting A2**,** the MISSION
    WEAPON/AMMO/SHEAF INFORMATION menu will be displayed defaulting to METHOD OF CONTROL.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

SELECT	USE ALL		CANCEL
F1	F2		F4

6. Using the page up/down, select the information where change is required. When no more adjustment is needed, press USE ALL (F2). The same menu will reappear with "COMPUTE GUN ORDERS?" at the bottom of the menu.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

COMPUTE GUN ORDERS?	YES	NO
	F3	F4

7. Press YES (F3). The FIRE DATA menu will appear summarizing all data with the resulting calculations.

FIRE DATA

MISSION 1		WEAPON	A2
TARGET CD0401		DEFLECTION	2430
HE M934A1 / MO		ELEVATION	1154
ADJUST FIRE		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	52.4

END
F4

8. Record the fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

2-12. SHIFT MISSION (cont).

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT		SHOT		FM MENU
F1		F2		F4

9. Highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA menu will appear.

SAFETY DATA

MISSION 1		WEAPON	A2
TARGET CD0401		RANGE TO TARGET	5438
HE M934A1 / MO		GUN-TGT AZIMUTH	0870
ADJUST FIRE		BP EASTING	15902
PARALLEL SHEAF		BP NORTHING	92870
ANGLE T 0049		MAX ORDINATE	+3480
		TIME OF FLIGHT	52.4

END
F4

10. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the
     initial fire command and send to the gun section. When the review of data is complete, press END (F4).
     The CURRENT MISSION MENU will appear. Press SHOT (F2). When SPLASH is observed, press F4.

FO CORRECTION

THE FO SENDS RIGHT 100, DROP 200.
RECORD IN OBSERVER
CORRECTIONS AND GO TO THE
CURRENT MISSION MENU.

11. Forward Observer W012 sends RIGHT 100, DROP 200.

CURRENT MISSION MENU

ADJUST AUF   REGISTRATION
ENTER FFE PHASE   REPLOT
EDIT/REVIEW MISSION DATA   MESSAGE QUEUE
REVIEW FIRE DATA   SEND MESSAGE MENU
REVIEW SAFETY DATA   SETUP SHOT/SPLASH
COMPUTE SOLUTION   END OF MISSION

SELECT		SHOT			FM MENU
F1		F2			F4

12. Highlight ADJUST AUF and press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu appears.

ADJUST AUF ENTER/REVIEW

ENTER NEW GRID ADJUST DATA
ENTER NEW LASER ADJUST DATA
REVIEW DATA

SELECT		CANCEL
F1		F4

13. Highlight ENTER NEW GRID ADJUST DATA, and press SELECT (F1).

ADJUST AUF

TARGET ID   CD0401
REFERENCE DIRECTION   OTHER
REFERENCE AZIMUTH   1900
DEVIATION   RIGHT _ _ _
RANGE   ADD   _ _ _
VERTICAL DISPLACEMENT   UP   _ _ _

SELECT		USE ALL			CANCEL
F1		F2			F4

14. Enter the FO corrections of RIGHT 100, DROP 200 in the computer. When changing the DEVIATION, RANGE, or VERTICAL DISPLACEMENT, the following menu changes occur.

2-12. SHIFT MISSION (cont).

ADJUST AUF

TARGET ID	CD0401
REFERENCE DIRECTION	OTHER
REFERENCE AZIMUTH	1900
DEVIATION	RIGHT 100
RANGE	DROP 200
VERTICAL DISPLACEMENT	UP _ _ _

CHANGE DEVIATION TO LEFT?

YES	NO
F3	F4

15. To change deviations, press YES (F3) or NO (F4) and then apply the correction. When all corrections are complete, press USE ALL (F2). The FIRE DATA menu will appear.

FIRE DATA

MISSION 1		WEAPON	A2
TARGET CD0401		DEFLECTION	2453
HE M934A1 / MO		ELEVATION	1175
ADJUST FIRE		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	52.8

END
F4

16. Record fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

17. Use the page up/down to highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA menu will appear.

SAFETY DATA

MISSION 1	WEAPON	A2
TARGET CD0401	RANGE TO TARGET	5248
HE M934A1 / MO	GUN-TGT AZIMUTH	0848
ADJUST FIRE	BP EASTING	15681
PARALLEL SHEAF	BP NORTHING	92833
ANGLE T 0049	MAX ORDINATE	+3539
	TIME OF FLIGHT	52.8

END

F4

NOTE

SPLASH appears on the screen approximately ten seconds before the splash occurs.

18. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the fire command and send to the gun section. When the review of data is complete, press END (F4). The CURRENT MISSION MENU will appear. Press SHOT (F2). When SPLASH is observed, press CONTINUE (F4). The CURRENT MISSION MENU will appear.

FO CORRECTION

THE FO SENDS ADD 100.
RECORD IN OBSERVER
CORRECTIONS AND GO TO THE
CURRENT MISSION MENU.

19. Forward Observer W012 sends ADD 100.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT	FM MENU
F1	F2	F4

20. Highlight ADJUST AUF and press SELECT (F1); the ADJUST AUF ENTER/REVIEW menu appears.

2-12. SHIFT MISSION (cont).

ADJUST AUF ENTER/REVIEW

ENTER NEW GRID ADJUST DATA
ENTER NEW LASER ADJUST DATA
REVIEW DATA

SELECT		CANCEL
F1		F4

21. Highlight ENTER NEW GRID ADJUST DATA and press SELECT (F1). The ADJUST AUF menu appears.

ADJUST AUF

TARGET ID	CD0401
REFERENCE DIRECTION	OTHER
REFERENCE AZIMUTH	1900
DEVIATION	RIGHT _ _ _
RANGE	ADD _ _ _
VERTICAL DISPLACEMENT	UP _ _ _

SELECT	USE ALL		CANCEL
F1	F2		F4

22. Enter the FO range correction of ADD 100 in the computer. When changing the DEVIATION, RANGE, or VERTICAL DISPLACEMENT, the following menu changes occur.

ADJUST AUF

TARGET ID	CD0401
REFERENCE DIRECTION	OTHER
REFERENCE AZIMUTH	1900
DEVIATION	RIGHT _ _ _
RANGE	ADD 100
VERTICAL DISPLACEMENT	UP _ _ _

CHANGE RANGE TO DROP?	YES	NO
	F3	F4

23. To change RANGE, press YES (F3) or NO (F4) and then apply the correction. When all corrections are complete, press USE ALL (F2). The FIRE DATA menu will appear.

FIRE DATA

MISSION 1		WEAPON	A2
TARGET CD0401		DEFLECTION	2436
HE M934A1 / MO		ELEVATION	1170
ADJUST FIRE		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	52.7

END
F4

24. Record fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT		SHOT		FM MENU
F1		F2		F4

25. Use the page up/down to highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA menu will appear.

SAFETY DATA

MISSION 1		WEAPON	A2
TARGET CD0401		RANGE TO TARGET	5300
HE M934A1 / MO		GUN-TGT AZIMUTH	0864
ADJUST FIRE		BP EASTING	15777
PARALLEL SHEAF		BP NORTHING	92804
ANGLE T 0049		MAX ORDINATE	+3525
		TIME OF FLIGHT	52.7

END
F4

2-12. SHIFT MISSION (cont).

26. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the fire command and send to the gun section. When the review of data is complete, press END (F4). The CURRENT MISSION MENU will appear. Press SHOT (F2). When SPLASH is observed, press F4.

```
┌─────────────────────────────────────┐
│                                     │
│           FO CORRECTION             │
│                                     │
│       THE FO SENDS RIGHT 50,        │
│          DROP 50, FFE.              │
│        RECORD IN OBSERVER           │
│      CORRECTIONS AND GO TO THE      │
│        CURRENT MISSION MENU.        │
│                                     │
│                                     │
└─────────────────────────────────────┘
```

27. Forward Observer W012 sends RIGHT 50, DROP 50, FIRE FOR EFFECT.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

28. Highlight ADJUST AUF and press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu appears.

ADJUST AUF ENTER/REVIEW

ENTER NEW GRID ADJUST DATA
ENTER NEW LASER ADJUST DATA
REVIEW DATA

SELECT	CANCEL
F1	F4

29. Highlight ENTER NEW GRID ADJUST DATA and press SELECT (F1). The ADJUST AUF menu appears.

ADJUST AUF

TARGET ID   CD0401
REFERENCE DIRECTION   OTHER
REFERENCE AZIMUTH   1900
DEVIATION   RIGHT _ _ _
RANGE   ADD   _ _ _
VERTICAL DISPLACEMENT   UP   _ _ _

SELECT	USE ALL	CANCEL
F1	F2	F4

30. Enter the FO DEVIATION correction of RIGHT 50 and RANGE correction of DROP 50 in the computer. When changing the DEVIATION, RANGE, or VERTICAL DISPLACEMENT, the following menu changes occur.

ADJUST AUF

TARGET ID   CD0401
REFERENCE DIRECTION   OTHER
REFERENCE AZIMUTH   1900
DEVIATION   RIGHT 050
RANGE   DROP 050
VERTICAL DISPLACEMENT   UP   _ _ _

CHANGE DEVIATION TO LEFT? | YES | | NO |
                                   F3   F4

31. To change deviations/range, press YES (F3) or NO (F4) and then apply the correction. When all corrections are complete, press USE ALL (F2). The FIRE DATA menu will appear.

FIRE DATA

MISSION 1   WEAPON   A2
TARGET   CD0401   DEFLECTION   2439
HE   M934A1 / MO   ELEVATION   1176
ADJUST FIRE   CHARGE   4
PARALLEL SHEAF   FUZE SETTING   0.0
                                 TIME OF FLIGHT   52.9

END
F4

32. Record fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

2-12. SHIFT MISSION (cont).

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

33. Page up/down to highlight ENTER FFE PHASE. Press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will appear.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120	SHEAF	PARALLEL
METHOD OF CONTROL	FIRE FOR EFFECT	APPLY REG CF	NO
ADDITIONAL WEAPONS	A1, A3, A4	MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	03
FUZE	MO		

SELECT	USE ALL		CANCEL
F1	F2		F4

34. When the data has been reviewed, press USE ALL (F2). The screen will reappear with the question "Compute Gun Orders?" at the bottom.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120	SHEAF	PARALLEL
METHOD OF CONTROL	FIRE FOR EFFECT	APPLY REG CF	NO
ADDITIONAL WEAPONS	A1, A3, A4	MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	03
FUZE	MO		

COMPUTE GUN ORDERS?	YES	NO
	F3	F4

35. Press YES (F3) to compute fire data. The FIRE DATA menu appears.

FIRE DATA

MISSION 1		WEAPON	A2
TARGET CD0401		DEFLECTION	2439
HE M934A1 / MO		ELEVATION	1176
FIRE FOR EFFECT		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	52.9

PREVIOUS	NEXT		END
F1	F2		F4

36.   The FIRE DATA menu shows data for the Fire for Effect. To review section data, press NEXT (F2) to reach A2. Record A2 data in DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ADJUST SHEAF	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

37.   Highlight REVIEW SAFETY DATA and press SELECT (F1). The A2 Safety Data information is as follows: RANGE TO TARGET 5231, GUN-TGT AZIMUTH 0861, BP Easting 15715, BP Northing 92770, MO +3544, TIME OF FLIGHT 52.9, and Angle T 0049. Review the data and record; then press END (F4) and the CURRENT MISSION MENU will appear. Select SHOT (F2). The CURRENT MISSION MENU will reappear; press CONTINUE (F4).

NOTE

The Forward Observer W012 sends End of Mission, target destroyed.

38.   Highlight END OF MISSION and press SELECT (F1). END OF MISSION MENU appears.

2-12. SHIFT MISSION (cont).

END OF MISSION MENU

CURRENT MISSION 1

END WITHOUT SAVING
RECORD SURVEYED TARGET
RECORD NON-SURVEYED TARGET
RECORD AS FPF LINE

SELECT		CANCEL
F1		F4

39. Highlight RECORD NON-SURVEYED TARGET. Press SELECT (F1) and the TARGET/KNOWN POINT DATA menu appears. Enter known point of 01.

TARGET/KNOWN POINT DATA

KNOWN POINT ID	01
SAVED TARGET ID	CD0401
SURVEYED	NO
EASTING	15715
NORTHING	92770
ALTITUDE	+0150

SELECT	USE ALL		CANCEL
F1	F2		F4

40. Press USE ALL (F2). The CONFIRM ESTIMATE OF ROUNDS FIRED screen appears.

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   015

SELECT	USE ALL		END
F1	F2		F4

41. The CONFIRM ESTIMATE OF ROUNDS FIRED is the estimate of rounds fired. The FDC must check DA Form 2399, Computer's Record, to confirm it. Press USE ALL (F2) and the menu will appear again with inventory at the bottom.

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   015

M934A1 INVENTORY LOW. 72 ROUNDS REMAIN   CONTINUE

F4

42.   Press CONTINUE (F4) and the computer returns to FIRE MISSIONS MENU. FDC records the burst point and firing data on DA Form 2188-R, Data Sheet.

<h2>2-13. RESECTION.</h2>

In order to compute the firing data for a polar mission, the location of a Forward Observer (FO) must be in the computer. There are several ways to set up the FO data in the computer; one is using resection since the exact location of the FO is not known.

Sample Resection Objectives:

An initialized MBC and a direction to two known points (from the previous Grid and Shift missions) from the Forward Observer's location are needed to perform the following:

- Determine the Forward Observer's location using resection.

- Determine grid coordinate location and record as a Forward Observer.

1. F022 has arrived in the area and is unsure of his exact location. He states that he can see CD0400 at a direction of 1750 mils and at a vertical angle of down 0105. He also has determined the azimuth to CD0401 to be at 2150 mils. To determine the exact location of F022 and store it in the computer, go to MBC MAIN MENU. Highlight SURVEY MENU and press SELECT (F1). The SURVEY MENU will appear.

SURVEY MENU

INTERSECTION
RESECTION
TRAVERSE

SELECT	CANCEL
F1	F4

2. Highlight RESECTION using page up/down; press SELECT (F1). The DEFINED KNOWN POINT IDS screen appears.

DEFINED KNOWN POINT IDS

00
01

SELECT	CANCEL
F1	F4

3. The DEFINED KNOWN POINT IDS menu shows the saved targets fired. If this is a point that the FO sent (00), press SELECT (F1). This will bring up the RESECTION menu. If the points the FO sent are not saved targets, input the data using the unknown point.

RESECTION

KNPT 1 ID	00
KNPT 1 DIRECTION	_ _ _ _
VERTICAL ANGLE	_ _ _ _ _
KNPT 2 ID	_ _
KNPT 2 DIRECTION	_ _ _ _
UNKNOWN POINT	
EASTING	_ _ _ _ _
NORTHING	_ _ _ _ _
ALTITUDE	_ _ _ _ _

ACCEPT	CLEAR	CANCEL
F2	F3	F4

4. Place KNPT 1 DIRECTION of 1750 and VERTICAL ANGLE Down 0105 into the computer. Upon entering the data for known point 00, press ACCEPT (F2). The DEFINED KNOWN POINT IDS menu will reappear. Highlight the other point 01 and press SELECT (F1). Then enter KNPT 2 DIRECTION of 2150 into the computer; press ACCEPT (F2).

RESECTION

KNPT 1 ID	00
KNPT 1 DIRECTION	1750
VERTICAL ANGLE	-0105
KNPT 2 ID	01
KNPT 2 DIRECTION	2150
UNKNOWN POINT	
EASTING	14191
NORTHING	93684
ALTITUDE	+0304

SELECT	USE ALL	CLEAR ALL	CANCEL
F1	F2	F3	F4

5. Press USE ALL (F2); the SAVE POINT TYPE menu will appear.

▊ **2-13. RESECTION (cont).**

SAVE POINT TYPE

KNOWN POINT
TARGET
FORWARD OBSERVER
WEAPON

SELECT		CANCEL
F1		F4

6. Use page up/down to highlight FORWARD OBSERVER; press SELECT (F1).

SAVE SURVEY DATA

EASTING	14191
NORTHING	93684
ALTITUDE	+0304
SAVE AS	FORWARD OBSERVER
FORWARD OBSERVER CALL	_ _ _ _

ACCEPT	CLEAR	CANCEL
F2	F3	F4

7. Check the SAVE SURVEY DATA screen. Input the forward observer call sign F022; press ACCEPT (F2). The SAVE SURVEY DATA screen will be shown with all the data saved.

SAVE SURVEY DATA

EASTING	14191
NORTHING	93684
ALTITUDE	+0304
SAVE AS	FORWARD OBSERVER
FORWARD OBSERVER CALL	F022

SELECT	USE ALL		CANCEL
F1	F2		F4

8. Press USE ALL (F2); the computer will return to MBC MAIN MENU. Use page up/down to view the location of the Forward Observer and enter the Network ID/Number, from the MBC MAIN MENU. Highlight FORWARD OBSERVERS; press SELECT (F1). The FORWARD OBSERVER (FO) CALL screen will appear.

FORWARD OBSERVER (FO) CALL

NEW FO
F022
W012

SELECT	FINISHED		CANCEL
F1	F2		F4

9. Use page up/down to highlight F022; press SELECT (F1). The FORWARD OBSERVER DATA screen appears.

FORWARD OBSERVER DATA

FORWARD OBSERVER CALL	F022
NETWORK ID	F
FORWARD OBSERVER NUMBER	22
SUBSCRIBER TYPE	FO
DEVICE TYPE	UNKNOWN
FO LOCATION	
EASTING	14191
NORTHING	93684
ALTITUDE	+0304

SELECT	USE ALL	DELETE	CANCEL
F1	F2	F3	F4

10. Enter NETWORK ID and FORWARD OBSERVER NUMBER and press ACCEPT (F2). After data is reviewed, press USE ALL (F2). The FORWARD OBSERVER (FO) CALL screen will reappear with the FO saved.

■ **2-13. RESECTION (cont).**

FORWARD OBSERVER (FO) CALL

NEW FO
F022
W012

SELECT	FINISHED	CANCEL
F1	F2	F4

11. Press FINISHED (F2). The MBC MAIN MENU appears. The forward observer location must be recorded on DA Form 2188-R, Data Sheet, to complete the resection problem.

2-14. POLAR MISSION.

Resection was used to determine the coordinates and altitude of an unknown point or the Forward Observer's (FO) location. The FO's location was determined and stored into the computer so it is possible to compute the data for a polar mission.

Sample Polar Mission Objectives:

An initialized MBC computer; a call for fire; DA Form 2399, Computer's Record; and DA Form 2188-R, Data Sheet, are needed to perform the following:

- Compute firing data for a polar mission using an MBC.

- Compute firing data for a polar mission for deflection and elevation.

```
FIRE MISSION


J36
ADJUST FIRE POLAR
DIRECTION 1220
DISTANCE 2300
VERTICAL INTERVAL DOWN 011
3 BMP'S IN OPEN
```

1. The Forward Observer W012 sends FDC the following fire request. Record the data on DA Form 2399, Computer's Record, and prepare the FDC order.

```
FDC ORDER


SEC
#2 GUN
1 ROUND
HEQ
3 ROUNDS
W/R
```

2. Enter the fire request into the MBC computer using the MBC MAIN MENU. Highlight FIRE MISSIONS and press SELECT (F1). The FIRE MISSIONS MENU will appear.

2-14. POLAR MISSION (cont).

FIRE MISSIONS MENU

GRID MISSION
SHIFT MISSION
POLAR MISSION
LASER POLAR MISSION
FINAL PROTECTIVE FIRE
SELECT ACTIVE MISSION
END OF MISSION (EOM)

SELECT		MAIN MENU
F1		F4

3. Using the page up/down button, highlight POLAR MISSION. Press SELECT (F1). The POLAR MISSION menu will appear.

POLAR MISSION

MISSION NUMBER	1
TARGET ID	CD0402
FO CALL	
REFERENCE DIRECTION	GUN-TGT
AZIMUTH TO TARGET	_ _ _ _
HORIZONTAL RANGE	_ _ _ _
VERTICAL INTERVAL	UP 000

SELECT	USE ALL		CANCEL
F1	F2		F4

4. Use page up/down and highlight FO CALL; press SELECT (F1). The FO CALL menu appears.

FO CALL

NONE
F022
W012

SELECT		CANCEL
F1		F4

5. Use page up/down to highlight W012; press SELECT (F1). The screen returns to POLAR MISSION menu with W012 and FO-TGT on screen.

POLAR MISSION

MISSION NUMBER	1
TARGET ID	CD0402
FO CALL	W012
REFERENCE DIRECTION	FO-TGT
AZIMUTH TO TARGET	1220
HORIZONTAL RANGE	2300
VERTICAL INTERVAL	DOWN 011

SELECT	USE ALL	CANCEL
F1	F2	F4

6. With the FO stored into mission data, put the OT direction or AZIMUTH TO TARGET in the computer. AZIMUTH TO TARGET is 1220, distance or HORIZONTAL RANGE is 2300, and VERTICAL INTERVAL is DOWN 011. When the firing data is entered, press USE ALL (F2). The BASE GUN SELECTION menu appears.

BASE GUN SELECTION

A1
A2
A3
A4

SELECT	CANCEL
F1	F4

7. Use page up/down to highlight A2; press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF INFORMATION menu will appear.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

SELECT	USE ALL	CANCEL
F1	F2	F4

8. Use page up/down and select the information where change is required. When no more adjustment is needed, press USE ALL (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION menu will reappear with the question "COMPUTE GUN ORDERS?" at the bottom of the screen.

2-14. POLAR MISSION (cont).

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

COMPUTE GUN ORDERS?

YES		NO
F3		F4

9. Press YES (F3). The FIRE DATA menu will appear summarizing all data with the resulting calculations.

FIRE DATA

MISSION 1		WEAPON	A2
TARGET CD0402		DEFLECTION	2089
HE M934A1 / MO		ELEVATION	1293
ADJUST FIRE		CHARGE	1
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	31.6

END
F4

10. Record fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT		SHOT		FM MENU
F1		F2		F4

11. Highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA menu will appear.

SAFETY DATA

MISSION 1	WEAPON	A2
TARGET CD0402	RANGE TO TARGET	1446
HE M934A1 / MO	GUN-TGT AZIMUTH	1211
ADJUST FIRE	BP EASTING	13142
PARALLEL SHEAF	BP NORTHING	89838
ANGLE T 0009	MAX ORDINATE	+1375
	TIME OF FLIGHT	31.6

```
+-----------+
|    END    |
+-----------+
     F4
```

NOTE

SPLASH appears on the screen approximately ten seconds before the splash occurs.

12. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the initial fire command and send to the gun section. When the review of data is complete, press END (F4). The CURRENT MISSION MENU will appear; press SHOT (F2). When SPLASH is observed, press CONTINUE (F4). The CURRENT MISSION MENU will appear.

```
+-------------------------------------+
|                                     |
|          FO CORRECTION              |
|                                     |
|   THE FO SENDS LEFT 200, ADD 400.   |
|       RECORD IN OBSERVER            |
|    CORRECTIONS AND GO TO THE        |
|      CURRENT MISSION MENU.          |
|                                     |
+-------------------------------------+
```

13. The Forward Observer W012 sends correction of LEFT 200, ADD 400. Record in observer's corrections. At the CURRENT MISSION MENU, highlight ADJUST AUF.

2-14. POLAR MISSION (cont).

CURRENT MISSION MENU

ADJUST AUF   REGISTRATION
ENTER FFE PHASE   REPLOT
EDIT/REVIEW MISSION DATA   MESSAGE QUEUE
REVIEW FIRE DATA   SEND MESSAGE MENU
REVIEW SAFETY DATA   SETUP SHOT/SPLASH
COMPUTE SOLUTION   END OF MISSION

SELECT		SHOT			FM MENU
F1		F2			F4

14. With ADJUST AUF highlighted, press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu appears.

ADJUST AUF ENTER/REVIEW

ENTER NEW GRID ADJUST DATA
ENTER NEW LASER ADJUST DATA
REVIEW DATA

SELECT		CANCEL
F1		F4

15. Use page up/down and highlight ENTER NEW GRID ADJUST DATA; press SELECT (F1). The ADJUST AUF menu appears.

ADJUST AUF

TARGET ID   CD0402
REFERENCE DIRECTION   FO-TGT
REFERENCE AZIMUTH   1220
DEVIATION   RIGHT _ _ _
RANGE   ADD   _ _ _
VERTICAL DISPLACEMENT   UP   _ _ _

SELECT		USE ALL			CANCEL
F1		F2			F4

16. The correction LEFT 200, ADD 400 sent by the Forward Observer W012 is placed in the computer in the ADJUST AUF menu by using page up/down. When changing the DEVIATION, RANGE, or VERTICAL DISPLACEMENT, the following screen change occurs. After the correction is entered, press SELECT (F1).

ADJUST AUF

TARGET ID   CD0402
REFERENCE DIRECTION   FO-TGT
REFERENCE AZIMUTH   1220
DEVIATION   LEFT 200
RANGE   ADD 400
VERTICAL DISPLACEMENT   UP _ _ _

CHANGE DEVIATION TO LEFT? | YES | | NO |
                                   F3   F4

17. To change deviation and range, press YES (F3) or NO (F4) and then apply the correction. When all corrections are complete, press USE ALL (F2). The FIRE DATA menu will appear on the screen with firing data.

FIRE DATA

MISSION 1   WEAPON   A2
TARGET   CD0402   DEFLECTION   2197
HE M934A1 / MO   ELEVATION   1187
ADJUST FIRE   CHARGE   1
PARALLEL SHEAF   FUZE SETTING   0.0
                                TIME OF FLIGHT   30.2

                                        | END |
                                           F4

18. Record the fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF   REGISTRATION
ENTER FFE PHASE   REPLOT
EDIT/REVIEW MISSION DATA   MESSAGE QUEUE
REVIEW FIRE DATA   SEND MESSAGE MENU
REVIEW SAFETY DATA   SETUP SHOT/SPLASH
COMPUTE SOLUTION   END OF MISSION

| SELECT | | SHOT | | FM MENU |
    F1   F2   F4

2-14. POLAR MISSION (cont).

19. Safety data is needed before fire data is sent to the guns. Use page up/down and highlight REVIEW SAFETY DATA. Press SELECT (F1). The SAFETY DATA menu will appear.

<div align="center">

SAFETY DATA

</div>

MISSION 1	WEAPON A2
TARGET CD0402	RANGE TO TARGET 1858
HE M934A1 / MO	GUN-TGT AZIMUTH 1103
ADJUST FIRE	BP EASTING 13441
PARALLEL SHEAF	BP NORTHING 90170
ANGLE T 0009	MAX ORDINATE +1290
	TIME OF FLIGHT 30.2

<div align="center">

END
F4

</div>

20. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the fire command and send to the gun section. Press END (F4) on SAFETY DATA menu. The CURRENT MISSION MENU will appear. Select SHOT (F2) when the base gun fires. When SPLASH is observed, press CONTINUE (F4).

<div align="center">

FO CORRECTION

THE FO SENDS ADD 200.
RECORD IN OBSERVER
CORRECTIONS AND GO TO THE
CURRENT MISSION MENU.

</div>

21. The Forward Observer W012 calls back with ADD 200. On the CURRENT MISSION MENU, highlight ADJUST AUF and press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu appears.

<div align="center">

ADJUST AUF ENTER/REVIEW

ENTER NEW GRID ADJUST DATA
ENTER NEW LASER ADJUST DATA
REVIEW DATA

</div>

SELECT		CANCEL
F1		F4

22. Use page up/down and highlight ENTER NEW GRID ADJUST DATA; press SELECT (F1). The ADJUST AUF menu appears.

ADJUST AUF

TARGET ID	CD0402
REFERENCE DIRECTION	FO-TGT
REFERENCE AZIMUTH	1220
DEVIATION	RIGHT _ _ _
RANGE	ADD _ _ _
VERTICAL DISPLACEMENT	UP _ _ _

SELECT		USE ALL		CANCEL
F1		F2		F4

23. The correction ADD 200 sent by the Forward Observer W012 is placed in the computer in the ADJUST AUF menu by using page up/down. When changing the DEVIATION, RANGE, or VERTICAL DISPLACEMENT, the following screen change occurs.

ADJUST AUF

TARGET ID	CD0402
REFERENCE DIRECTION	FO-TGT
REFERENCE AZIMUTH	1220
DEVIATION	RIGHT _ _ _
RANGE	ADD 200
VERTICAL DISPLACEMENT	UP _ _ _

CHANGE RANGE TO DROP? | YES | | NO |

F3   F4

24. To change range, press YES (F3) or NO (F4) and then apply the correction. When all corrections are complete, press USE ALL (F2). The FIRE DATA menu will appear on the screen with firing data.

FIRE DATA

MISSION 1	WEAPON	A2
TARGET CD0402	DEFLECTION	2186
HE M934A1 / MO	ELEVATION	1125
ADJUST FIRE	CHARGE	1
PARALLEL SHEAF	FUZE SETTING	0.0
	TIME OF FLIGHT	29.4

END
F4

2-14. POLAR MISSION (cont).

25. Record fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

26. Before fire data is sent to the guns, the safety data must be reviewed. Use page up/down and highlight REVIEW SAFETY DATA; press SELECT (F1). The SAFETY DATA menu will appear.

SAFETY DATA

MISSION 1		WEAPON	A2
TARGET CD0402		RANGE TO TARGET	2057
HE M934A1 / MO		GUN-TGT AZIMUTH	1115
ADJUST FIRE		BP EASTING	13628
PARALLEL SHEAF		BP NORTHING	90243
ANGLE T 0009		MAX ORDINATE	+1229
		TIME OF FLIGHT	29.4

END
F4

27. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the fire command and send to the gun section. Press END (F4) on SAFETY DATA menu. The CURRENT MISSION MENU appears. Select SHOT (F2) when the base gun fires. When SPLASH is observed, press CONTINUE (F4).

```
┌─────────────────────────────────────────────┐
│                                               │
│              FO CORRECTION                    │
│                                               │
│        THE FO SENDS DROP 050 FFE.             │
│          RECORD IN OBSERVER                   │
│        CORRECTIONS AND GO TO THE              │
│          CURRENT MISSION MENU.                │
│                                               │
│                                               │
└─────────────────────────────────────────────┘
```

28. The Forward Observer W012 calls back with DROP 050 FFE. To ENTER FFE PHASE make the final adjustment in ADJUST AUF. From the CURRENT MISSION MENU, highlight ADJUST AUF and press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu will appear. Highlight ENTER NEW GRID ADJUST DATA and press SELECT (F1). The ADJUST AUF menu will appear. Enter the correction sent by the FO W012 and press USE ALL (F2). Record the Fire Data and return to the CURRENT MISSION MENU by pressing END (F4).

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

29. Highlight ENTER FFE PHASE and press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen appears.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120	SHEAF	PARALLEL
METHOD OF CONTROL	FIRE FOR EFFECT	APPLY REG CF	NO
ADDITIONAL WEAPONS	A1, A3, A4	MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	03
FUZE	MO		

SELECT	USE ALL		CANCEL
F1	F2		F4

30. When the data has been reviewed, press USE ALL (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear with the question "COMPUTE GUN ORDERS?" at the bottom.

2-14. POLAR MISSION (cont).

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120	SHEAF	PARALLEL
METHOD OF CONTROL	FIRE FOR EFFECT	APPLY REG CF	NO
ADDITIONAL WEAPONS	A1, A3, A4	MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	03
FUZE	MO		

COMPUTE GUN ORDERS?

YES	NO
F3	F4

31. Press YES (F3) to compute fire data. The FIRE DATA screen appears with DEFLECTION, ELEVATION, and other fire data. Record the fire data on DA Form 2399, Computer's Record, along with safety data.

FIRE DATA

MISSION	1	WEAPON	A2
TARGET	CD0402	DEFLECTION	2188
HE M934A1 / MO		ELEVATION	1142
FIRE FOR EFFECT		CHARGE	1
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	29.6

PREVIOUS	NEXT		END
F1	F2		F4

32. The FIRE DATA menu shows data for the fire for effect. Press NEXT (F2) to select the other weapons as necessary. When finished, press END (F4) and the CURRENT MISSION MENU will appear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ADJUST SHEAF	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

33. Highlight REVIEW SAFETY DATA and press SELECT (F1).

SAFETY DATA

MISSION 1		WEAPON	A2
TARGET CD0402		RANGE TO TARGET	2007
HE M934A1 / MO		GUN-TGT AZIMUTH	1112
FIRE FOR EFFECT		BP EASTING	13581
PARALLEL SHEAF		BP NORTHING	90225
ANGLE T 0009		MAX ORDINATE	+1245
		TIME OF FLIGHT	29.6

PREVIOUS	NEXT		END
F1	F2		F4

34. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the fire command and send to the gun section. Press END (F4) on SAFETY DATA menu and the CURRENT MISSION MENU appears. Press SHOT (F2).

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ADJUST SHEAF	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	**END OF MISSION**

SELECT	SHOT		FM MENU
F1	F2		F4

35. When SPLASH appears, press CONTINUE (F4). Use page up/down and highlight END OF MISSION. Press SELECT (F1). The END OF MISSION MENU will appear.

END OF MISSION MENU

CURRENT MISSION 1

END WITHOUT SAVING
RECORD SURVEYED TARGET
RECORD NON-SURVEYED TARGET
RECORD AS FPF LINE

SELECT		CANCEL
F1		F4

2-14. POLAR MISSION (cont).

36. To save this target, use page up/down and highlight RECORD NON-SURVEYED TARGET. Press SELECT (F1) and the TARGET/KNOWN POINT DATA menu appears.

TARGET/KNOWN POINT DATA

KNOWN POINT ID	02
SAVED TARGET ID	CD0402
SURVEYED	NO
EASTING	13581
NORTHING	90225
ALTITUDE	+0139

SELECT	USE ALL		CANCEL
F1	F2		F4

37. Press SELECT (F1) and enter the KNOWN POINT ID as 02. When the burst point has been recorded, press ACCEPT (F2) and check DA Form 2399, Computer's Record, to confirm the estimate of rounds fired. Press USE ALL (F2) and the CONFIRM ESTIMATE OF ROUNDS FIRED menu appears.

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   015

SELECT	USE ALL		END
F1	F2		F4

38. The CONFIRM ESTIMATE OF ROUNDS FIRED is the estimate of rounds fired. The FDC must check DA Form 2399, Computer's Record, to confirm it. Press USE ALL (F2) and the menu will reappear with inventory at the bottom of the menu.

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   015

M934A1 INVENTORY LOW. 57 ROUNDS REMAIN	CONTINUE
	F4

39. Press CONTINUE (F4) and the computer returns to FIRE MISSIONS MENU. The FDC records the burst point and firing data on DA Form 2188-R, Data Sheet. The FO W012 called back and gave EOM 50% casualties.

2-15. REGISTRATION MISSION.

Prepare to Register RP01, Grid E15200/N93300, RP01, Altitude +0150.

1. The FO W012 sends the FDC the following fire request:

    SEC, #2 Gun, 1 Round, HEQ, W/R.

2. Enter the fire request into the MBC computer using the MBC MAIN MENU and highlight FIRE MISSIONS. Press SELECT (F1); FIRE MISSIONS MENU is displayed.

3. Use page up/down and select GRID MISSION. Press SELECT (F1) and the GRID MISSION screen is shown.

4. Highlight FO CALL and press SELECT (F1). Highlight W012 and press SELECT (F1). Highlight REFERENCE DIRECTION and press SELECT (F1). At the REFERENCE DIRECTION menu, highlight FO-TGT and press SELECT (F1). The GRID MISSION screen appears. Enter the Grid Data from the FO W012 and press USE ALL (F2).

5. The BASE GUN SELECTION screen will appear. Highlight A2 and press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF INFORMATION menu will be displayed.

6. Highlight METHOD OF CONTROL and press SELECT (F1). The METHOD OF CONTROL screen will appear.

7. Highlight REGISTRATION and press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF INFORMATION menu will reappear. Press USE ALL (F2).

8. The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear with the question "COMPUTE GUN ORDERS?" at the bottom. Press YES (F3) and the FIRE DATA menu will appear summarizing all data with calculations. The data received is as follows: Deflection 2583, Elevation 1012, Charge 3, Time of Flight (TOF) 43.0.

9. Record the fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU will appear.

10. Highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA menu will appear. The Safety Data received is as follows: Range to Target (RTT) 5250, Gun-Tgt Azimuth (GTA) 0718, BP Easting 15200, BP Northing 93300, MO +2417, TOF 43.0, Angle T 0070.

11. On DA Form 2399, Computer's Record, record RANGE TO TARGET and GUN-TGT AZIMUTH. Fill out the initial fire command and send to the gun section. After the review of data is complete, press END (F4). The CURRENT MISSION MENU will appear. Default will be to REGISTRATION.

NOTE

SPLASH appears on the screen approximately ten seconds before the splash occurs.

12. Press SHOT (F2). After the time of flight has expired, SPLASH will appear. To continue, press CONTINUE (F4). After CONTINUE (F4) has been pressed, the default will be to REGISTRATION. Press SELECT (F1).

13. The REGISTRATION MENU will appear. PRECISION (GRID) will be the default; press SELECT (F1). The PRECISION REGISTRATION MENU will appear.

2-15. REGISTRATION MISSION (cont).

NOTE

The FO W012 sends Left 100, Drop 200.

14. Highlight ADJUST AUF; press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu will appear.

15. Highlight ENTER NEW GRID ADJUST DATA using page up/down and press SELECT (F1). The ADJUST AUF screen appears.

16. Place the corrections sent by the FO W012 into the computer in the ADJUST AUF menu.

17. Review data input and press USE ALL (F2). The FIRE DATA menu will appear on the screen with firing data. The data received is as follows: Weapon A2, Deflection 2606, Elevation 1050, Charge 3, TOF 44.0.

18. Record fire data on DA Form 2399, Computer's Record, and press END (F4). The PRECISION REGISTRATION MENU will appear. Highlight SAFETY DATA and press SELECT (F1). The SAFETY DATA screen appears.

19. Review SAFETY DATA. The Safety Data received is as follows: RTT 5058, GTA 0695, BP Easting 14989, BP Northing 93227, MO +2523, TOF 44.0, Angle T 0070. Press END (F4). The PRECISION REGISTRATION MENU screen reappears. Press SHOT (F2). After the time of flight is completed, SPLASH will appear at the bottom of the screen. Press CONTINUE (F4) and the PRECISION REGISTRATION MENU appears.

NOTE

The FO W012 sends Left 100, Add 075.

20. After the correction is sent by the FO W012, use page up/down to highlight ADJUST AUF. Press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu will appear.

21. Highlight ENTER NEW GRID ADJUST DATA and press SELECT (F1).

22. Enter the correction into the computer at the ADJUST AUF menu.

23. Review data input and press USE ALL (F2). The FIRE DATA menu will appear with the firing data. The data received is as follows: Weapon A2, Deflection 2624, Elevation 1034, Charge 3, TOF 43.6.

24. Record fire data on DA Form 2399, Computer's Record, and press END (F4). The PRECISION REGISTRATION MENU will appear.

25. Use page up/down to highlight SAFETY DATA; press SELECT (F1). The SAFETY DATA menu appears.

26. Record safety data. Safety Data received is as follows: RTT 5143, GTA 0676, BP Easting 14970, BP Northing 93350, MO +2478, TOF 43.6, Angle T 0070. Press END (F4). The PRECISION REGISTRATION MENU appears.

27. Press SHOT (F2). When SPLASH is observed, press CONTINUE (F4). The PRECISION REGISTRATION MENU reappears.

28. Highlight ADJUST AUF; press SELECT (F1). The ADJUST AUF ENTER/REVIEW menu appears.

29. Highlight ENTER NEW GRID ADJUST DATA and press SELECT (F1). The ADJUST AUF menu appears.

NOTE

The FO W012 sends Left 050, Drop 025, Registration Complete.

30. Record the corrections in observer corrections on DA Form 2399. Place the corrections sent by the FO W012 into the computer in the ADJUST AUF menu by using page up/down.

31. Review data input and press USE ALL (F2).

32. Record the fire data on DA Form 2399, Computer's Record. The data received is as follows: Weapon A2, Deflection 2635, Elevation 1038, Charge 3, TOF 43.7. Press END (F4). The PRECISION REGISTRATION MENU will appear.

33. Highlight SAFETY DATA. Press SELECT (F1) and review safety data. The Safety Data received is as follows: RTT 5124, GTA 0666, BP Easting 14916, BP Northing 93367, MO +2488, TOF 43.7, Angle T 0070.

34. Record range to target on DA Form 2399, Computer's Record. Send firing data (#2 Gun, DNF S/R) to the guns. Press END (F4) on the SAFETY DATA menu. The PRECISION REGISTRATION MENU will appear.

35. When the gun is ready to fire, inform the forward observer as the round is shot. Press SHOT (F2). When SPLASH is observed, press CONTINUE (F4). The PRECISION REGISTRATION MENU reappears.

36. Page down to highlight REGISTRATION DATA; press SELECT (F1).

37. Review the registration data (RCF: -024, LEFT: 052) and other data (BP 15200/93300, Alt +0150). Record data on DA Form 2399, Computer's Record. Registration is complete; the Sheaf can be adjusted. Press USE ALL (F2) to continue. The CURRENT MISSION MENU will appear.

38. Highlight EDIT/REVIEW MISSION DATA and press SELECT (F1).

39. The GRID MISSION screen appears. Check to make sure the information is correct and that the Target Location is the same as was first given. If correct, press USE ALL (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will appear.

40. To adjust the Sheaf, highlight METHOD OF CONTROL. Press SELECT (F1) and the METHOD OF CONTROL menu appears.

41. Highlight FIRE FOR EFFECT; press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF INFORMATION menu appears again.

42. Verify that METHOD OF CONTROL has changed to FIRE FOR EFFECT with A1, A3, and A4 additional weapons included. The question "SAVE REGISTRATION DATA?" appears at the bottom of the screen. Press YES (F3). The screen reappears with "RP 1: DCF=LEFT 52, RCF=-24" at the bottom of the screen. Press CONTINUE (F4). The screen reappears.

43. In this example, two options exist. The first option is to page up/down to ROUNDS PER GUN and change ammunition from 01 to 03 rounds. Option two is to press SHOT (F2) three times to fire three rounds, once for each weapon A1, A3, and A4. The screen reappears; press USE ALL (F2). The question "REGISTRATION PHASE COMPLETED?" appears.

44. Press YES (F3). The screen reappears with the question "COMPUTE GUN ORDERS?" at the bottom.

45. Press YES (F3). The guns will appear with WEAPON A1 firing data of Deflection 2635, Elevation 1038.

2-15. REGISTRATION MISSION (cont).

NOTE

The guns will require adjustment after the FO W012 sends the correction.

46. To view the other guns, press NEXT (F2). At end of review for A2, A3, and A4 weapons, press END (F4).

47. The CURRENT MISSION MENU appears. Highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA menu appears.

48. Review and record the safety data: Weapon A2, RTT 5124, GRID 14916/93367. Press END (F4). The CURRENT MISSION MENU appears. Press SHOT (F2). (NOTE: Three rounds will be deleted from inventory.) Press CONTINUE (F4) when SPLASH appears.

49. The FO W012 will adjust the Sheaf. At the CURRENT MISSION MENU, highlight ADJUST SHEAF and press SELECT (F1). The ADJUST SHEAF ENTER/REVIEW menu will appear.

NOTE

The FO W012 sends the correction for the specific guns as follows: A1: L45; A3: L20; A4, ADJ. Record in observer corrections on DA Form 2399, Computer's Record.

50. Highlight ENTER NEW ADJUST DATA by pressing SELECT (F1). The ADJUSTING WEAPON screen appears.

51. Select the weapon to be adjusted (A1); press SELECT (F1). The ADJUST SHEAF menu will appear for A1.

52. Make the correction for WEAPON A1 (LEFT 045). When finished, press USE ALL (F2).

53. New firing data will appear for WEAPON A1. After the data (Deflection: 2644, Elevation: 1036, and TOF: 43.7) has been recorded in DA Form 2399, Computer's Record, press END (F4) to finish adjustment of the other weapon.

54. Select ADJUST SHEAF to finish adjustment of the other weapon by pressing SELECT (F1).

55. Select ENTER NEW ADJUST DATA by pressing SELECT (F1).

56. Select the weapon to be adjusted (A3) and press SELECT (F1). The ADJUST SHEAF menu will appear for A3.

57. Make the correction for WEAPON A3 (LEFT 020) and press ACCEPT (F2). When finished, press USE ALL (F2).

58. The FIRE DATA menu will appear for A3 with the new firing data (Deflection: 2638, Elevation: 1038, TOF: 43.7). Review safety data RTT: 5131. Verify the data on the screen.

59. Press END (F4) to finish. The CURRENT MISSION MENU will appear.

60. Highlight END OF MISSION and press SELECT (F1).

61. Since this is a Registration Mission, end the mission by highlighting RECORD SURVEYED TARGET. Press SELECT (F1).

62. The TARGET/KNOWN POINT DATA menu will appear with the new data. Record as KNOWN POINT ID 03 and press ACCEPT (F2). The Burst Point for CD0403 is EASTING 15200, NORTHING 93300, and ALTITUDE +0150. If correct, press USE ALL (F2) and the CONFIRM ESTIMATE OF ROUNDS FIRED menu will appear.

63. The CONFIRM ESTIMATE OF ROUNDS FIRED menu is the estimate of rounds fired. The FDC must check DA Form 2399, Computer's Record, to confirm the round count. Press USE ALL (F2) and the menu will appear again with the Inventory Low remaining at the bottom of the screen. Press CONTINUE (F4). The MBC MAIN MENU appears.

64. Highlight REGISTRATION DATA and press SELECT (F1). REGISTRATION POINT ID MENU appears.

65. Highlight "1" under NEW REG PT. Press SELECT (F1). The REGISTRATION DATA menu appears. Record data. Press USE ALL (F2). REGISTRATION POINT ID MENU reappears. Press MAIN MENU (F4).

2-16. SETUP FOR DIGITAL MISSIONS.

This procedure will setup and initialize digital communications utilizing an MBC while performing a Forward Entry Device (FED)/Forward Observers System (FOS) supported mission. The MBC communications menu enables the operator to interface digitally with the FED, FOS, and Advanced Field Artillery Tactical Data System (AFATDS).

The MBC can be connected by field wire or radio communications enabling the MBC computer to receive AFATDS/FED/FOS supported fire missions. Refer to Appendix H for radio setup procedures.

The following example will describe how to setup the MBC to receive AFATDS/FED/FOS supported missions. This example describes the procedure to manually add a Forward Observer (FO) into the computer.

NOTE

As fire missions progress, messages may be received to alert the operator to problems in completion of the mission. Refer to Appendix I for operator alert and error messages.

This MBC setup data is needed to compute the Digital Grid Mission.

1. Select SECTION A from the SECTION SELECTION menu by using arrow keys to highlight section.

SECTION SELECTION

SECTION A

SECTION B

SECTION C

SELECT		CANCEL
F1		F4

2. Then press SELECT (F1).

3. The WEAPON SYSTEM SELECTION menu will appear.

WEAPON SYSTEM SELECTION

60 MM/M19
60 MM/M224
81 MM/M29A1
81 MM/M252
81 MM/M303
107 MM/M30
120 MM/M120

SELECT		CANCEL
F1		F4

4. Highlight 120 MM/M120 from WEAPON SYSTEM SELECTION menu and press SELECT (F1). The SECTION DATA menu will now appear.

2-16. SETUP FOR DIGITAL MISSIONS (cont).

SECTION DATA

SECTION ID	A
WEAPON SYSTEM	120 MM/M120
MOUNTING	**GROUND**
LOCATION METHOD	BASE PIECE
SECTION AZIMUTH	0700
SECTION DEFLECTION	2800

SELECT	USE ALL		CANCEL
F1	F2		F4

5. Highlight MOUNTING and press SELECT (F1). Change GROUND to CARRIER. Highlight LOCATION METHOD   BASE PIECE and press SELECT (F1). Select NO (F4) option from resulting question: "CHANGE LOC METHOD TO INDEPENDENT?"

6. Select SECTION AZIMUTH from the menu.

7. Enter SECTION AZIMUTH data "0700". Press ACCEPT (F2).

8. SECTION DEFLECTION data "2800" will appear**.**

9. SECTION DEFLECTION will default to 2800, if no change is needed. Select USE ALL (F2).

10. The DEFINED WEAPON menu will appear.

11. NEW WEAPON will be highlighted on DEFINED WEAPON menu. Press SELECT (F1).

DEFINED WEAPON

NEW WEAPON

SELECT	FINISHED		CANCEL
F1	F2		F4

12. Highlight WEAPON A2 (Base Gun) from UNDEFINED WEAPON menu using arrow keys. Then press SELECT (F1).

UNDEFINED WEAPON

WEAPON A1
WEAPON A2
WEAPON A3
WEAPON A4
WEAPON A5
WEAPON A6

SELECT		CANCEL
F1		F4

NOTE

CLEAR (F3) deletes data on working line and allows for correction.

13. WEAPON DATA (BASE PIECE) menu will now appear. Enter the following data into this menu. As data is entered, press ACCEPT (F2) or ENTER after each entry.

WEAPON DATA (BASE PIECE)

BASE PIECE WEAPON ID	A2
EASTING	09760
NORTHING	78720
ALTITUDE	+0150

SELECT	USE ALL		CANCEL
F1	F2		F4

14. Press USE ALL (F2) when finished with data entry.

15. DEFINED WEAPON menu will now appear with WEAPON A2 entered in the system.

16. Highlight NEW WEAPON and press SELECT (F1).

DEFINED WEAPON

NEW WEAPON
WEAPON A2

SELECT	FINISHED		CANCEL
F1	F2		F4

2-16. SETUP FOR DIGITAL MISSIONS (cont).

17.   UNDEFINED WEAPON menu appears.

NOTE

Weapon list will now appear without base gun WEAPON A2.

UNDEFINED WEAPON

WEAPON A1
WEAPON A3
WEAPON A4
WEAPON A5
WEAPON A6

SELECT		CANCEL
F1		F4

18.   Highlight WEAPON A1 and press SELECT (F1). WEAPON DATA (ALTERNATE PIECE) menu will now appear.

19.   Enter the following data:

WEAPON DATA (ALTERNATE PIECE)

ALTERNATE PIECE WEAPON ID	**A1**
DIRECTION FROM BASE PIECE	2450
DISTANCE FROM BASE PIECE	075

ACCEPT	CLEAR	CANCEL
F2	F3	F4

20.   Press ACCEPT (F2) after each entry and then press USE ALL (F2) when finished.

21.   DEFINED WEAPON menu will reappear with the following information. Highlight NEW WEAPON and press SELECT (F1).

DEFINED WEAPON

NEW WEAPON
WEAPON A1
WEAPON A2

SELECT	FINISHED		CANCEL
F1	F2		F4

22. The UNDEFINED WEAPON menu will reappear as in step 20. Select WEAPON A3. The WEAPON DATA (ALTERNATE PIECE) menu will appear. Enter the following data.

WEAPON DATA (ALTERNATE PIECE)

ALTERNATE PIECE WEAPON ID   **A3**
DIRECTION FROM BASE PIECE   5700
DISTANCE FROM BASE PIECE   075

ACCEPT	CLEAR	CANCEL
F2	F3	F4

23. Press ACCEPT (F2) after each entry. When finished with data entry, press USE ALL (F2).

NOTE

To place WEAPON A4 repeat steps 21 through 23 entering DIRECTION 5700, DISTANCE +150.
If additional weapons are required, follow steps 21 through 23.

24. When all weapons have been placed from DEFINED WEAPON menu, press FINISHED (F2).

25. AMMUNITION PRE-SELECT 120 MM/M120 screen will now appear. Enter the following data (PROPELLANT TEMPERATURE +070). Press ACCEPT (F2).

AMMUNITION PRE-SELECT 120 MM/M120

PROPELLANT TEMPERATURE (F)   +070

HE - HIGH EXPLOSIVE   M934
WP- WHITE PHOSPHORUS   M929
ILL - ILLUMINATION   M930
IR - IR ILLUMINATION   M983

TRN - TRAINING   M931

SELECT	USE ALL	CANCEL
F1	F2	F4

26. Highlight HE - HIGH EXPLOSIVE and press SELECT (F1). HE - HIGH EXPLOSIVE 120 MM/M120 screen appears. Highlight M934A1 and press SELECT (F1).

HE - HIGH EXPLOSIVE 120 MM/M120

M933
M934
M934A1

SELECT	CANCEL
F1	F4

2-16. SETUP FOR DIGITAL MISSIONS (cont).

27. When the propellant temperature and ammunition data are correct, select USE ALL (F2). AMMO INVENTORY 120 MM/M120 screen appears.

<div align="center">

AMMO INVENTORY 120 MM/M120

HE - HIGH EXPLOSIVE
WP - WHITE PHOSPHORUS
ILL - ILLUMINATION
IR - IR ILLUMINATION
TRN - TRAINING

</div>

SELECT	FINISHED		CANCEL
F1	F2		F4

28. Highlight HE-HIGH EXPLOSIVE on the AMMO INVENTORY 120 MM/M120 screen and press SELECT (F1). AMMO INVENTORY (HE) screen appears.

<div align="center">

NOTE

</div>

There will be 100 rounds of M934A1 HE ammunition for this mission sample. The AMMO LOW WARNING LIMIT PER ROUND will be 99.

<div align="center">

AMMO INVENTORY (HE)

</div>

PROJECTILE	QUANTITY
M933	
M934	
M934A1	100
AMMO LOW WARNING LIMIT PER ROUND	99

SELECT	USE ALL		CANCEL
F1	F2		F4

29. Highlight M934A1 and press SELECT (F1). Enter in the ammunition available (100 M934A1) and press USE ALL (F2) to accept. If required, page down to change AMMO LOW WARNING LIMIT PER ROUND. Change the WARNING to 99 for this example. If not required, press USE ALL (F2). AMMO INVENTORY 120 MM/M120 screen will reappear. When data entry is completed, press FINISHED (F2).

MBC MAIN MENU

SET UP DATA   MET SELECTION
SECTION DATA   SAFETY GEOMETRY
FORWARD OBSERVERS   REGISTRATION DATA
KNOWN POINTS   SURVEY MENU
TARGET LOCATIONS   **COMMUNICATION MENU**
FIRE MISSIONS

SELECT

F1

30. From MBC MAIN MENU highlight COMMUNICATION MENU; press SELECT (F1). The COMMUNICATION MENU appears.

COMMUNICATION MENU

COMMUNICATION SETUP
SUBSCRIBER TABLE
MESSAGE QUEUE
SEND MESSAGE

| SELECT | | MAIN MENU |
|---| |---|

F1   F4

31. Highlight COMMUNICATION SETUP and press SELECT (F1) to start the initialization. The COMMUNICATION SETUP menu will appear.

2-16. SETUP FOR DIGITAL MISSIONS (cont).

COMMUNICATION SETUP

COMM CHANNEL	A
DEVICE TYPE	**2 WIRE**
MODULATION	FSK-188B
BAUD RATE	1200
BLOCK MODE	SINGLE
KEYTONE	1.4
NET ACCESS DELAY TIME	00
UNIT NET ID	
ENTER AUTH CODE	NO
DEFAULT AUTH CODE	_ _

SELECT	USE ALL	CANCEL
F1	F2	F4

32. At the COMMUNICATION SETUP menu, enter the COMM CHANNEL, DEVICE TYPE, and UNIT NET ID as a minimum. Highlight DEVICE TYPE and press SELECT (F1). The COMMUNICATION DEVICE TYPES menu will appear.

COMMUNICATION DEVICE TYPES

2 WIRE
SINCGARS

SELECT	CANCEL
F1	F4

33. Highlight the type of device to use. This exercise will be using SINCGARS. Press SELECT (F1). The COMMUNICATION SETUP menu will reappear.

COMMUNICATION SETUP

COMM CHANNEL	A
DEVICE TYPE	SINCGARS
MODULATION	NRZ
BAUD RATE	1200
BLOCK MODE	SINGLE
KEYTONE	1.4
NET ACCESS DELAY TIME	00
UNIT NET ID	**M**
ENTER AUTH CODE	NO
DEFAULT AUTH CODE	XX

SELECT	USE ALL		CANCEL
F1	F2		F4

34. After the DEVICE TYPE has been changed to SINCGARS, the UNIT NET ID must be entered. Cursor up/down to UNIT NET ID, enter the UNIT NET ID of M, and press ACCEPT (F2). Enter the DEFAULT AUTH CODE of XX and press ACCEPT (F2). The MODULATION, BAUD RATE, BLOCK MODE, KEYTONE, NET DELAY TIME, and AUTH CODE remain the same.

CAUTION

To avoid software corruption, do not touch keyboard while communications software is enabling.

35. Press USE ALL (F2). The COMMUNICATION SETUP menu will appear first with a message to indicate enabling communication: "ENABLING DIGITAL COMMUNICATION. PLEASE WAIT" at top center of screen. The COMMUNICATION MENU will appear.

COMMUNICATION MENU

COMMUNICATION SETUP
SUBSCRIBER TABLE
MESSAGE QUEUE
SEND MESSAGE

SELECT		MAIN MENU
F1		F4

36. Highlight SUBSCRIBER TABLE and press SELECT (F1). The SUBSCRIBER TABLE menu will appear.

2-16. SETUP FOR DIGITAL MISSIONS (cont).

SUBSCRIBER TABLE

ADR	TYPE	DEVICE	ID
S	FO	UNKNOWN	S025

ENTER NEW SUBSCRIBER

SELECT		COMMO MENU
F1		F4

37. Highlight ENTER NEW SUBSCRIBER and press SELECT (F1). The SUBSCRIBER DATA menu will appear.

SUBSCRIBER DATA

NETWORK ID	B
SUBSCRIBER TYPE	FO
DEVICE TYPE	UNKNOWN
SUBSCRIBER ID	_ _ _ _

SELECT	USE ALL		CANCEL
F1	F2		F4

38. Enter the NETWORK ID of B and press ACCEPT (F2). The SUBSCRIBER DATA screen appears again; page up/down to SUBSCRIBER TYPE and press SELECT (F1). The SUBSCRIBER TYPES menu appears.

SUBSCRIBER TYPES

FO
FO LASER
FIST
FSO

SELECT		CANCEL
F1		F4

39. With FO highlighted, press SELECT (F1). The SUBSCRIBER DATA menu appears again with DEVICE TYPE highlighted.

SUBSCRIBER DATA

NETWORK ID	B
SUBSCRIBER TYPE	FO
DEVICE TYPE	UNKNOWN
SUBSCRIBER ID	_ _ _ _

SELECT	USE ALL	CANCEL
F1	F2	F4

40. Highlight "DEVICE TYPE   UNKNOWN", press SELECT (F1), and the COMMUNICATION DEVICE TYPES menu appears.

COMMUNICATION DEVICE TYPES

UNKNOWN
TF DMD
FED
FIST DMD

SELECT	CANCEL
F1	F4

41. Highlight FED and press SELECT (F1). The SUBSCRIBER DATA menu appears with SUBSCRIBER ID highlighted.

SUBSCRIBER DATA

NETWORK ID	B
SUBSCRIBER TYPE	FO
DEVICE TYPE	FED
SUBSCRIBER ID	**B001**

SELECT	USE ALL	CANCEL
F1	F2	F4

42. Enter B001 and press ACCEPT (F2). The SUBSCRIBER DATA screen reappears. After the review of data is complete, press USE ALL (F2) and the SUBSCRIBER TABLE screen appears.

2-16. SETUP FOR DIGITAL MISSIONS (cont).

SUBSCRIBER TABLE

ADR	TYPE	DEVICE	ID
B	FO	FED	B001
S	FO	UNKNOWN	S025

ENTER NEW SUBSCRIBER

SELECT	COMMO MENU
F1	F4

43. Review the data and press COMMO MENU (F4). The COMMUNICATION MENU will appear.

COMMUNICATION MENU

COMMUNICATION SETUP
SUBSCRIBER TABLE
MESSAGE QUEUE
SEND MESSAGE

SELECT	MAIN MENU
F1	F4

44. At COMMUNICATION MENU, highlight MESSAGE QUEUE, which holds all incoming messages. Press SELECT (F1). Since there are no messages present or available, the bottom of the screen will state "NO AVAILABLE MESSAGES". If there are messages, this selection will allow incoming messages to be read, by pressing EXPAND (F1). Press CONTINUE (F4). To send a message, page up/down to SEND MESSAGE and press SELECT (F1). The SEND MESSAGE MENU screen will appear. This menu covers outgoing messages to the FO.

SEND MESSAGE MENU

SHOT/SPLASH
FO COMMAND
MESSAGE TO OBSERVER
MPI ORIENTING DATA
FREE TEXT
TEST MESSAGE

SELECT	CANCEL
F1	F4

45. Page up/down to FO COMMAND and press SELECT (F1). The SUBSCRIBER CHOICES menu appears.

SUBSCRIBER CHOICES

B	**FO**	**FED**	**B001**
S	FO	UNKNOWN	S025

■

SELECT	CANCEL
F1	F4

46. Highlight "B   FO   FED   B001" and press SELECT (F1). The TRANSMIT FO COMMAND menu appears.

TRANSMIT FO COMMAND

AUTH CODE   XX
SUBSCRIBER   B   FO   FED   B001
FO CALL
FO COMMAND   **SHOT**
TARGET NUMBER
OBSERVER NUMBER   00

SELECT	XMIT	CANCEL
F1	F3	F4

47. Highlight "FO COMMAND   SHOT" and press SELECT (F1). The FO COMMAND CHOICE screen is shown.

FO COMMAND CHOICE

SHOT	CHECK FIRE ALL
SPLASH	READY
DESIGNATE	RDS COMPLETE
FIRE	CANCEL CHECK FIRE
CHECK FIRE	

SELECT	CANCEL
F1	F4

48. The FO COMMAND CHOICE menu shows different commands that can be sent to the FO. Press CANCEL (F4) and TRANSMIT FO COMMAND screen appears. Press CANCEL (F4) again to return to SEND MESSAGE MENU.

2-16. SETUP FOR DIGITAL MISSIONS (cont).

SEND MESSAGE MENU

SHOT/SPLASH
FO COMMAND
MESSAGE TO OBSERVER
MPI ORIENTING DATA
FREE TEXT
TEST MESSAGE

SELECT	CANCEL
F1	F4

49. Highlight TEST MESSAGE and press SELECT (F1). The SUBSCRIBER menu appears.

SUBSCRIBER

B	FO	FED	B001
S	**FO**	**UNKNOWN**	**S025**

SELECT	CANCEL
F1	F4

50. Highlight "S   FO   UNKNOWN   S025" and press SELECT (F1). The TRANSMIT TEST MESSAGE menu appears.

TRANSMIT TEST MESSAGE

AUTH CODE   XX
SUBSCRIBER   S   FO   UNKNOWN   S025
TEST MESSAGE   LOPO123456789ABCDE

SELECT	XMIT	CANCEL
F1	F3	F4

51. To send test message, press XMIT (F3) and message is sent. The SEND MESSAGE MENU appears again.

SEND MESSAGE MENU

SHOT/SPLASH
FO COMMAND
MESSAGE TO OBSERVER
MPI ORIENTING DATA
FREE TEXT
TEST MESSAGE

SELECT	CANCEL
F1	F4

52. Use page up/down to highlight FREE TEXT; press SELECT (F1). The SUBSCRIBER menu will appear.

SUBSCRIBER

B	FO	FED	B001
S	**FO**	**UNKNOWN**	**S025**

SELECT	CANCEL
F1	F4

53. Highlight "S   FO   UNKNOWN   S025" and press SELECT (F1). The TRANSMIT FREE TEXT menu appears.

TRANSMIT FREE TEXT

AUTH CODE   XX
SUBSCRIBER   S FO UNKNOWN S025
FO CALL   S025
MESSAGE   _____
OBSERVER NUMBER   25

ACCEPT	CLEAR	CANCEL
F2	F3	F4

54. To send a message, page up/down to MESSAGE and type in the message (example, TEST SHOT OVER).

2-16. SETUP FOR DIGITAL MISSIONS (cont).

TRANSMIT FREE TEXT

AUTH CODE	XX
SUBSCRIBER	S FO UNKNOWN S025
FO CALL	S025
MESSAGE	TEST SHOT OVER
OBSERVER NUMBER	25

SELECT		XMIT	CANCEL
F1		F3	F4

55. Press ACCEPT (F2) and then XMIT (F3) to send message. The FO FED will beep to indicate an incoming message is received. Press CANCEL (F4) and the COMMUNICATION MENU screen appears.

COMMUNICATION MENU

COMMUNICATION SETUP
SUBSCRIBER TABLE
MESSAGE QUEUE
SEND MESSAGE

SELECT		MAIN MENU
F1		F4

56. End of the setup data. Continue with instructions in paragraph 2-17.

2-17. DIGITAL MISSION.

The following example will describe how to process a digital Grid Mission with communication setup loaded in the MBC and using a FED/SINCGARS device. For this example the Communication Device Type used is SINCGARS; other choices will be given.

The following information is necessary to complete the example grid mission.

<div style="border:1px solid black; padding:10px;">

CALL FOR FIRE

J36
13500/83250
WEAPON
DIRECTION 0650
ALTITUDE 0170

</div>

<div style="border:1px solid black; padding:10px;">

FR GRID MESSAGE FROM FOS

DEST: M
EASTING: 13500
NORTHING: 83250
ALTITUDE: 00170
DIRECTION: 0650
TARGET: PERS, UNK
RADIUS/LENGTH: N/G
DOP: N/G
CONTROL: ADJ FIRE
SHELL/FUZE: NO PREF
VOLLEYS: N/G
ANGLE: HI
PRIORITY: NORMAL
RADIO ZONE: N/G
TARGET NO: DC0401
GRID ZONE: STD
OBSERVER: 25

</div>

FDC ORDER

SECTION
#2 GUN
1 ROUND
HEQ
3 ROUNDS FFE
W/R

FO CORRECTIONS

1st: LEFT 100/DROP 0200
2nd: ADD 0100
3rd: DROP 0050 FFE
LAST: EOM

1st SUBQ ADJ MESSAGE FROM FOS

DEST: M
DIRECTION: 0650
SHIFT R/L: LFT 0100
      A/D: DRP 0200
      U/D: N/G
CONTROL: ADJ FIRE
SHELL/FUZE: NO PREF
ANGLE: HI
OBSN RNDS: OK
TARGET NO: DC0401
OBSERVER: 25

2nd SUBQ ADJ MESSAGE FROM FOS

DEST: M
DIRECTION: 0650
SHIFT R/L: N/G
        A/D: ADD 0100
        U/D: N/G
CONTROL: ADJ FIRE
SHELL/FUZE: NO PREF
ANGLE: HI
OBSN RNDS: OK
TARGET NO: DC0401
OBSERVER: 25

3rd SUBQ ADJ MESSAGE FROM FOS

DEST: M
DIRECTION: 0650
SHIFT R/L: N/G
        A/D: DRP 0050
        U/D: N/G
CONTROL: FFE
SHELL/FUZE: HE/QUICK
ANGLE: HI
OBSN RNDS: OK
TARGET NO: DC0401
OBSERVER: 25

EOM&SURV MESSAGE FROM FOS

DEST: M
TARGET NO: DC0401
SHIFT R/L: N/G
        A/D: N/G
        U/D: N/G
CONTROL: EOM RAT
TARGET: PERS, PATROL
DISPOSITION: NEUT
CASUALTY: 0006
OBSERVER: 25

2-17. DIGITAL MISSION (cont).

COMMUNICATION MENU

COMMUNICATION SETUP
SUBSCRIBER TABLE
MESSAGE QUEUE
SEND MESSAGE

AN INCOMING MESSAGE HAS BEEN RECEIVED

CONTINUE

F4

1. When an incoming message is received, it will appear on the bottom of the screen. Press CONTINUE (F4); the same screen reappears.

COMMUNICATION MENU

COMMUNICATION SETUP
SUBSCRIBER TABLE
MESSAGE QUEUE
SEND MESSAGE

SELECT

F1

MAIN MENU

F4

2. Highlight MESSAGE QUEUE and press SELECT (F1). This will bring up the MESSAGE QUEUE screen.

MESSAGE QUEUE

FR GRID   11:00   18/06/2000   DC040   S
                                                    1

EXPAND

F1

DELETE

F3

END

F4

3. The MESSAGE QUEUE screen appears with FR GRID message. Press EXPAND (F1) to bring up the Grid Mission message. The FIRE REQUEST GRID screen appears.

FIRE REQUEST GRID

FM 1 DIRECTION	FO-TGT 0650	WIDTH	NOT GIVEN
EASTING	13500	STRENGTH	25
NORTHING	83250	SHELL/FUZE	HE/QUICK
ALTITUDE	0170	CONTROL	ADJ FIRE
GRID ZONE	STANDARD	ANGLE	HIGH ANGLE
TGT TYPE	PERS	PRIORITY	NORMAL
TGT SUBTYPE	PTL	TARGET NUMBER	DC0401
ATTITUDE	0000	VOLLEYS	
DOP	NOT GIVEN	PRIORITY ZONE	
RADIUS/LENGTH	NOT GIVEN	OBSERVER NUMBER	25

FIRE MISSION	CANCEL
F2	F4

4. Record the data on DA Form 2399, Computer's Record. Press FIRE MISSION (F2). The GRID MISSION screen appears.

GRID MISSION

MISSION NUMBER	1
TARGET ID	DC0401
FO CALL	S025
REFERENCE DIRECTION	OTHER
REFERENCE AZIMUTH	0650
TARGET LOCATION: EASTING	13500
NORTHING	83250
ALTITUDE	+0170

SELECT	USE ALL	CANCEL
F1	F2	F4

5. Review the GRID MISSION and record information on DA Form 2399, Computer's Record. Press USE ALL (F2). The BASE GUN SELECTION menu appears.

BASE GUN SELECTION

A1
A2
A3
A4

SELECT	CANCEL
F1	F4

6. Highlight the adjusting gun (A2 for this mission), and press SELECT (F1). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will appear.

2-17. DIGITAL MISSION (cont).

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

SELECT	USE ALL		CANCEL
F1	F2		F4

7. Review the MISSION WEAPON/AMMO/SHEAF INFORMATION screen and press USE ALL (F2); the same screen will reappear.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

COMPUTE GUN ORDERS?	YES	NO
	F3	F4

8. The question "COMPUTE GUN ORDERS?" will appear at the bottom of the MISSION WEAPON/AMMO/SHEAF INFORMATION screen. Press YES (F3) to compute the Fire Mission. The FIRE DATA screen will appear for WEAPON A2.

FIRE DATA

MISSION 1		WEAPON	A2
TARGET DC0401		DEFLECTION	2797
HE M934A1 / MO		ELEVATION	1097
ADJUST FIRE		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	50.8

END
F4

9. Record the fire data for WEAPON A2 and press END (F4). The CURRENT MISSION MENU screen appears with REVIEW SAFETY DATA highlighted. Press SELECT (F1) to view the safety data. Record the safety data: ANGLE T 0104; RANGE TO TARGET 5874; press END (F4). ∎

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

NOTE

SPLASH appears on the screen approximately ten seconds before the round hits. ∎

10. The CURRENT MISSION MENU will appear again. Cursor up/down to SETUP SHOT/SPLASH and press ∎ SELECT (F1). The SHOT/SPLASH screen appears; press USE ALL (F2). The CURRENT MISSION MENU screen appears again; press XMIT SHOT (F2) to send the Shot to the FO. The CURRENT MISSION MENU screen appears again. Within a few seconds, SPLASH will appear. Press CONTINUE (F4). The CURRENT MISSION MENU appears.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	**MESSAGE QUEUE**
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

SELECT	SHOT		FM MENU
F1	F2		F4

11. Cursor up/down to MESSAGE QUEUE and wait for a message. When an incoming message is received, it ∎ will appear on the bottom of the screen. Press CONTINUE (F4) and SELECT (F1). The MESSAGE QUEUE screen appears.

2-17. DIGITAL MISSION (cont).

MESSAGE QUEUE

FR GRID	11:00	18/06/2000	DC040 1	S R P
SUBJ ADJ	11:03	18/06/2000	DC040 1	S

EXPAND	DELETE	END
F1	F3	F4

12. Cursor up/down to SUBJ ADJ and press EXPAND (F1) to pull up the message. The SUBSEQUENT ADJUST (GRID) screen appears.

SUBSEQUENT ADJUST (GRID)

DIRECTION	0650	SHELL/FUZE	HE/QUICK
OBSERVATION	OBSERVED	CONTROL	ADJ FIRE
RIGHT/LEFT	LEFT 0100	ANGLE	HIGH ANGLE
ADD/DROP	DROP 0200	TARGET NUMBER	DC0401
UP/DOWN	UP NOT GIVEN	OBSERVER NUMBER	25

ADJUST	CANCEL
F2	F4

13. Record the FO correction data on DA Form 2399, Computer's Record, and press ADJUST (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen appears.

14. Review the MISSION WEAPON/AMMO/SHEAF INFORMATION data and press USE ALL (F2). The same screen will reappear with the question "COMPUTE GUN ORDERS?" on the bottom of the screen. Press YES (F3). The FIRE DATA screen appears.

FIRE DATA

MISSION 1	WEAPON	A2
TARGET DC0401	DEFLECTION	2813
HE M934A1 / MO	ELEVATION	1123
ADJUST FIRE	CHARGE	4
PARALLEL SHEAF	FUZE SETTING	0.0
	TIME OF FLIGHT	51.5

END
F4

15. Record the fire data on DA Form 2399, Computer's Record, and press END (F4). The CURRENT MISSION MENU screen appears. Cursor up/down to highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA screen appears.

SAFETY DATA

MISSION 1		WEAPON	A2
TARGET DC0401		RANGE TO TARGET	5670
HE M934A1 / MO		GUN-TGT AZIMUTH	0687
ADJUST FIRE		BP EASTING	13301
PARALLEL SHEAF		BP NORTHING	83149
ANGLE T 0104		MAX ORDINATE	+3380
		TIME OF FLIGHT	51.5

END

F4

16. Record the safety data. Press END (F4). The CURRENT MISSION MENU screen appears.

17. From the CURRENT MISSION MENU screen, highlight SETUP SHOT/SPLASH and press SELECT (F1). The SHOT/SPLASH menu appears; press USE ALL (F2). The CURRENT MISSION MENU appears; press XMIT SHOT (F2) to send the Shot to the FO. The same screen will reappear in a few seconds with SPLASH on the screen. Press CONTINUE (F4) and the same screen will reappear. Cursor up/down to MESSAGE QUEUE and wait for an incoming message to be received; press CONTINUE (F4) and SELECT (F1). The MESSAGE QUEUE screen appears.

MESSAGE QUEUE

FR GRID	11:00	18/06/2000	DC0401	S R P
SUBJ ADJ	11:03	18/06/2000	DC0401	S R P
SUBJ ADJ	11:05	18/06/2000	DC0401	S

EXPAND	DELETE	END
F1	F3	F4

18. Cursor up/down to the last SUBJ ADJ message and press EXPAND (F1) to view the FO correction. The SUBSEQUENT ADJUST (GRID) screen appears.

2-17. DIGITAL MISSION (cont).

SUBSEQUENT ADJUST (GRID)

DIRECTION	0650	SHELL/FUZE	HE/QUICK
OBSERVATION	OBSERVED	CONTROL	ADJ FIRE
RIGHT/LEFT	RIGHT NOT GIVEN	ANGLE	HIGH ANGLE
ADD/DROP	ADD 0100	TARGET NUMBER	DC0401
UP/DOWN	UP NOT GIVEN	OBSERVER NUMBER	25

ADJUST		CANCEL
F2		F4

19. Record the corrections on DA Form 2399, Computer's Record, and press ADJUST (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen appears.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

SELECT	USE ALL		CANCEL
F1	F2		F4

20. Review the MISSION WEAPON/AMMO/SHEAF INFORMATION screen and press USE ALL (F2).

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120		
METHOD OF CONTROL	ADJUST FIRE	APPLY REG CF	NO
		MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	01
FUZE	MO		

COMPUTE GUN ORDERS?	YES	NO
	F3	F4

21. The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear, with the question "COMPUTE GUN ORDERS?" at the bottom. Press YES (F3) to compute the Fire Mission. The FIRE DATA screen will appear for WEAPON A2.

FIRE DATA

MISSION 1		WEAPON	A2
TARGET DC0401		DEFLECTION	2814
HE M934A1 / MO		ELEVATION	1111
ADJUST FIRE		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	51.1

```
┌──────────┐
│   END    │
└──────────┘
      F4
```

22. Record the fire data for WEAPON A2 and press END (F4). The CURRENT MISSION MENU screen appears; highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA screen will appear.

SAFETY DATA

MISSION 1		WEAPON	A2
TARGET DC0401		RANGE TO TARGET	5770
HE M934A1 / MO		GUN-TGT AZIMUTH	0686
ADJUST FIRE		BP EASTING	13360
PARALLEL SHEAF		BP NORTHING	83229
ANGLE T 0104		MAX ORDINATE	+3341
		TIME OF FLIGHT	51.1

```
┌──────────┐
│   END    │
└──────────┘
      F4
```

23. Record the safety data for this mission, and press END (F4).

24. The CURRENT MISSION MENU will appear again. Cursor up/down to SETUP SHOT/SPLASH and press SELECT (F1). The SHOT/SPLASH screen appears; press USE ALL (F2). The CURRENT MISSION MENU screen appears; press XMIT SHOT (F2) to send the Shot to the FO. The CURRENT MISSION MENU screen appears again. Within a few seconds, SPLASH will appear; press CONTINUE (F4).

2-17. DIGITAL MISSION (cont).

CURRENT MISSION MENU

ADJUST AUF   REGISTRATION
ENTER FFE PHASE   REPLOT
EDIT/REVIEW MISSION DATA   MESSAGE QUEUE
REVIEW FIRE DATA   SEND MESSAGE MENU
REVIEW SAFETY DATA   SETUP SHOT/SPLASH
COMPUTE SOLUTION   END OF MISSION

AN INCOMING MESSAGE HAS BEEN RECEIVED | CONTINUE |
                                             F4

25.   At the CURRENT MISSION MENU, highlight MESSAGE QUEUE and wait. The same screen appears with a message on the bottom of the screen. Press CONTINUE (F4) and then SELECT (F1). The MESSAGE QUEUE screen appears.

MESSAGE QUEUE

FR GRID	11:00	18/06/2000	DC040 1	S R P
SUBJ ADJ	11:03	18/06/2000	DC040 1	S R P
SUBJ ADJ	11:05	18/06/2000	DC040 1	S R P
SUBJ ADJ	11:08	18/06/2000	DC040 1	S

| EXPAND | | DELETE | | END |
   F1   F3   F4

26.   Scroll up/down to the last SUBJ ADJ message and press EXPAND (F1) to pull up the message.

SUBSEQUENT ADJUST (GRID)

DIRECTION	0650	SHELL/FUZE	HE/QUICK
OBSERVATION	OBSERVED	CONTROL	FFE
RIGHT/LEFT	RIGHT NOT GIVEN	ANGLE	HIGH ANGLE
ADD/DROP	DROP 0050	TARGET NUMBER	DC0401
UP/DOWN	UP NOT GIVEN	OBSERVER NUMBER	25

                    | ADJUST | | CANCEL |
                       F2   F4

27.   The SUBSEQUENT ADJUST (GRID) screen appears with new data for the FFE phase, the method of CONTROL changed to FFE, and SHELL/FUZE changed to HE/QUICK. Record the FO correction on DA Form 2399, Computer's Record, and press ADJUST (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen appears.

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120	SHEAF	PARALLEL
METHOD OF CONTROL	FIRE FOR EFFECT	APPLY REG CF	NO
ADDITIONAL WEAPONS	A1, A3, A4	MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	03
FUZE	MO		

SELECT	USE ALL	CANCEL
F1	F2	F4

28. Review the MISSION WEAPON/AMMO/SHEAF INFORMATION data and press USE ALL (F2).

MISSION WEAPON/AMMO/SHEAF INFORMATION

BASE GUN	A2	CHARGE	AUTO
WEAPON TYPE	120 MM/M120	SHEAF	PARALLEL
METHOD OF CONTROL	FIRE FOR EFFECT	APPLY REG CF	NO
ADDITIONAL WEAPONS	A1, A3, A4	MET	STANDARD
AMMO CATEGORY	HE (M934A1)	ROUNDS PER GUN	03
FUZE	MO		

COMPUTE GUN ORDERS?

YES	NO
F3	F4

29. The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear with the question "COMPUTE GUN ORDERS?" at the bottom. Press YES (F3). The FIRE DATA screen appears.

FIRE DATA

MISSION	1	WEAPON	A2
TARGET	DC0401	DEFLECTION	2814
HE M934A1 / MO		ELEVATION	1117
FIRE FOR EFFECT		CHARGE	4
PARALLEL SHEAF		FUZE SETTING	0.0
		TIME OF FLIGHT	51.3

PREVIOUS	NEXT	END
F1	F2	F4

2-17. DIGITAL MISSION (cont).

FIRE DATA

MISSION 1	WEAPON	A4
TARGET DC0401	DEFLECTION	2814
HE M934A1 / MO	ELEVATION	1117
FIRE FOR EFFECT	CHARGE	4
PARALLEL SHEAF	FUZE SETTING	0.0
	TIME OF FLIGHT	51.3

PREVIOUS		END
F1		F4

30. The fire data for WEAPON A1 will appear first. Press NEXT (F2) to view WEAPON A2 and the other guns in the platoon; press PREVIOUS (F1) to go back to a prior gun if needed. When finished with recording/viewing all of the guns, press END (F4). The CURRENT MISSION MENU screen appears.

31. At the CURRENT MISSION MENU screen, highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA screen appears.

SAFETY DATA

MISSION 1	WEAPON	A2
TARGET DC0401	RANGE TO TARGET	5720
HE M934A1 / MO	GUN-TGT AZIMUTH	0687
FIRE FOR EFFECT	BP EASTING	13330
PARALLEL SHEAF	BP NORTHING	83189
ANGLE T 0104	MAX ORDINATE	+3361
	TIME OF FLIGHT	51.3

PREVIOUS	NEXT	END
F1	F2	F4

32. The safety data for WEAPON A1 will appear first. Press NEXT (F2) to view safety data for WEAPON A2 and record. Ignore the other guns. Press END (F4). The CURRENT MISSION MENU will reappear.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ENTER FFE PHASE	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	**SETUP SHOT/SPLASH**
COMPUTE SOLUTION	END OF MISSION

SELECT		SHOT		FM MENU
F1		F2		F4

33. Highlight SETUP SHOT/SPLASH and press SELECT (F1). The SHOT/SPLASH screen appears; press USE ALL (F2). The CURRENT MISSION MENU screen appears again; press XMIT SHOT (F2) to send the Shot to the FO. The CURRENT MISSION MENU screen appears again. Within a few seconds, SPLASH will appear; press CONTINUE (F4). The CURRENT MISSION MENU screen appears.

CURRENT MISSION MENU

ADJUST AUF	REGISTRATION
ADJUST SHEAF	REPLOT
EDIT/REVIEW MISSION DATA	MESSAGE QUEUE
REVIEW FIRE DATA	SEND MESSAGE MENU
REVIEW SAFETY DATA	SETUP SHOT/SPLASH
COMPUTE SOLUTION	END OF MISSION

AN INCOMING MESSAGE HAS BEEN RECEIVED

CONTINUE
F4

34. Highlight MESSAGE QUEUE and wait for a message. When a message has been sent, it will appear on the screen. Press CONTINUE (F4) and then SELECT (F1). The MESSAGE QUEUE screen appears.

MESSAGE QUEUE

FR GRID	11:00	18/06/2000	DC0401	S R P
SUBJ ADJ	11:03	18/06/2000	DC0401	S R P
SUBJ ADJ	11:05	18/06/2000	DC0401	S R P
SUBJ ADJ	11:08	18/06/2000	DC0401	S R P
EOM SURV	11:11	18/06/2000	DC0401	S

EXPAND		DELETE	END
F1		F3	F4

35. Scroll up/down to EOM SURV and press EXPAND (F1) to pull up the message. The EOM & SURVEILLANCE screen will appear.

2-17. DIGITAL MISSION (cont).

EOM & SURVEILLANCE

DIRECTION	0650	DISPOSITION	NEUTRALIZED
RIGHT/LEFT	NOT GIVEN	CASUALTIES	6
ADD/DROP	NOT GIVEN	CONTROL	EOM RAT
UP/DOWN	NOT GIVEN	TARGET NUMBER	DC0401
TARGET TYPE	PERS	OBSERVER NUMBER	25
TARGET SUBTYPE	PTL		

PROCESS	CANCEL
F2	F4

36. Review and record the information on the EOM & SURVEILLANCE screen. Press PROCESS (F2). The END OF MISSION MENU screen appears.

END OF MISSION MENU

CURRENT MISSION 1

END WITHOUT SAVING
RECORD SURVEYED TARGET
RECORD NON-SURVEYED TARGET
RECORD AS FPF LINE

SELECT	CANCEL
F1	F4

37. The END OF MISSION MENU screen allows four different options to end the mission. Scroll up/down to RECORD NON-SURVEYED TARGET and press SELECT (F1). The TARGET/KNOWN POINT DATA screen will appear.

TARGET/KNOWN POINT DATA

KNOWN POINT ID	01
SAVED TARGET ID	DC0401
SURVEYED	NO
EASTING	13330
NORTHING	83189
ALTITUDE	+0170

SELECT	USE ALL	CANCEL
F1	F2	F4

38. To enter KNOWN POINT of 01, press SELECT (F1). Then enter 01 and record the data. Press SELECT (F1). The same screen reappears. Press ACCEPT (F2) and then USE ALL (F2). The CONFIRM ESTIMATE OF ROUNDS FIRED screen appears.

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   016

SELECT		USE ALL		END
F1		F2		F4

NOTE

If SHOT was not selected on all or any of the corrections, data can be edited at CONFIRM ESTIMATE OF ROUNDS FIRED screen.

39.   Verify number of rounds fired. Press USE ALL (F2).

CONFIRM ESTIMATE OF ROUNDS FIRED

HE/M934A1   016

M934A1 INVENTORY LOW. 84 ROUNDS REMAIN | CONTINUE |
                                                  |----------|
                                                  | F4 |

40.   The CONFIRM ESTIMATE OF ROUNDS FIRED screen appears again, with the message about inventory remaining. This is the amount of ammunition that is left. Press CONTINUE (F4) and the FIRE MISSIONS MENU screen appears.

FIRE MISSIONS MENU

GRID MISSION
SHIFT MISSION
POLAR MISSION
LASER POLAR MISSION
FINAL PROTECTIVE FIRE
SELECT ACTIVE MISSION
END OF MISSION (EOM)

SELECT		MAIN MENU
F1		F4

2-18. DIGITAL POLAR MISSION.

The following example will describe how to process a digital Polar Mission. The following information is necessary to complete the example polar mission.

CALL FOR FIRE

TARGET NUMBER: DC0402

LT MORTAR PLATOON DIGGING IN

DIRECTION: 1000

DISTANCE: 2200

FDC ORDER

SECTION

#2 GUN

1 ROUND I/A

3 ROUNDS I/FFE

W/R

FO CORRECTIONS

1st: LEFT 150/DROP

2nd: DROP 100

3rd: +50 FFE

LAST: EOMRAT

---

1.   On MBC MAIN MENU, highlight COMMUNICATION MENU and press SELECT (F1); this will bring up COMMUNICATION MENU screen.

2.   When an incoming message is received, it will appear on the bottom of the screen; press CONTINUE (F4). The same screen will reappear.

3.   Scroll up/down to highlight MESSAGE QUEUE and press SELECT (F1).

4.   The MESSAGE QUEUE screen appears with FR POLAR message. Press EXPAND (F1) to bring up POLAR MISSION screen.

5.   Record the data on DA Form 2399, Computer Record. Press FIRE MISSION (F2). The POLAR MISSION screen reappears.

6. Review POLAR MISSION screen and press USE ALL (F2). The BASE GUN SELECTION screen appears.

7. Scroll up/down to highlight adjusting gun A2; press SELECT (F1). The MISSION WEAPON/AMMO/ SHEAF INFORMATION screen will appear. Review the MISSION WEAPON/AMMO/SHEAF INFORMATION screen and press USE ALL (F2).

8. The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear with the question "COMPUTE GUN ORDERS?" at the bottom of the screen. Press YES (F3) to compute the fire mission. The FIRE DATA screen will appear with information for Weapon A2: DEFL 2247, ELEV 1284, CHARGE 2, and TOF 40.8.

9. Record firing data for Weapon A2 and press END (F4). The CURRENT MISSION MENU will appear with REVIEW SAFETY DATA highlighted. Press SELECT (F1). Review and record safety data: Angle T 0254, Range to Target (RTT) 2407. Press END (F4). The CURRENT MISSION MENU appears.

10. Scroll up/down to SETUP SHOT/SPLASH and press SELECT (F1). The SHOT/SPLASH screen appears; press USE ALL (F2). The CURRENT MISSION MENU appears again. Press XMIT SHOT (F2) to send the Shot to the FO. The CURRENT MISSION MENU appears. SPLASH appears when the TOF is expired. Press CONTINUE (F4). The CURRENT MISSION MENU appears.

11. Scroll up/down to MESSAGE QUEUE and wait for a message. When an incoming message is received, it will appear on the bottom of the screen. Press CONTINUE (F4) and SELECT (F1). The MESSAGE QUEUE screen appears.

12. Scroll up/down to SUBJ ADJ and press EXPAND (F1) to pull up the message. The SUBSEQUENT ADJUST (GRID) screen appears.

13. Record the FO corrections on DA Form 2399, Computer Record, and press ADJUST (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will appear. Review the data and press USE ALL (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear with the question "COMPUTE GUN ORDERS?" at the bottom of the screen. Press YES (F3). The FIRE DATA screen will appear with information for Weapon A2: DEFL 2301, ELEV 1304, and TOF 41.0.

14. Record the fire data on DA Form 2399, Computer Record, and press END (F4). The CURRENT MISSION MENU appears. Scroll up/down to REVIEW SAFETY DATA. Press SELECT (F1). The SAFETY DATA screen appears. Review the safety data and record Range to Target 2276. Press END (F4). The CURRENT MISSION MENU appears.

15. Scroll up/down to SETUP SHOT/SPLASH and press SELECT (F1). The SHOT/SPLASH screen appears; press USE ALL (F2). The CURRENT MISSION MENU appears again. Press XMIT SHOT (F2) to send the Shot to the FO. The CURRENT MISSION MENU appears. SPLASH appears when the TOF is expired. Press CONTINUE (F4). The CURRENT MISSION MENU appears.

16. Scroll up/down to MESSAGE QUEUE and wait for a message. When an incoming message is received, it will appear on the bottom of the screen. Press CONTINUE (F4) and SELECT (F1). The MESSAGE QUEUE screen appears.

17. Scroll up/down to SUBJ ADJ and press EXPAND (F1) to pull up the message. The SUBSEQUENT ADJUST (GRID) screen appears.

18. Record the FO corrections on DA Form 2399, Computer Record, and press ADJUST (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will appear. Review the data and press USE ALL (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear with the question "COMPUTE GUN ORDERS?" at the bottom of the screen. Press YES (F3). The FIRE DATA screen will appear with information for Weapon A2: DEFL 2292, ELEV 1318, and TOF 41.2.

2-18. DIGITAL POLAR MISSION (cont).

19. Record the fire data for Weapon A2 on DA Form 2399, Computer Record, and press END (F4). The CURRENT MISSION MENU appears. Scroll up/down to REVIEW SAFETY DATA. Press SELECT (F1). The SAFETY DATA screen appears. Review the safety data and record Range to Target 2178. Press END (F4). The CURRENT MISSION MENU appears.

20. Scroll up/down to SETUP SHOT/SPLASH and press SELECT (F1). The SHOT/SPLASH screen appears; press USE ALL (F2). The CURRENT MISSION MENU appears again. Press XMIT SHOT (F2) to send the Shot to the FO. The CURRENT MISSION MENU appears. SPLASH appears when the TOF is expired. Press CONTINUE (F4). The CURRENT MISSION MENU appears.

21. Scroll up/down to MESSAGE QUEUE and wait for a message. When an incoming message is received, it will appear on the bottom of the screen. Press CONTINUE (F4) and SELECT (F1). The MESSAGE QUEUE screen appears.

22. Scroll up/down to SUBJ ADJ and press EXPAND (F1) to pull up the message. The SUBSEQUENT ADJUST (GRID) screen appears. Review the information. Change the method of CONTROL from ADJ FIRE to FFE.

23. Record the FO corrections on DA Form 2399, Computer Record, and press ADJUST (F2). The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will appear. Review the data. ADDITIONAL WEAPONS should be changed to A1, A3, A4 and ROUNDS PER GUN should be 03. Record the MISSION WEAPON/AMMO/SHEAF INFORMATION and press USE ALL (F2).

24. The MISSION WEAPON/AMMO/SHEAF INFORMATION screen will reappear with the question "COMPUTE GUN ORDERS?" at the bottom of the screen. Press YES (F3). The FIRE DATA screen will appear with data for Weapon A1. Press NEXT (F2) to view data for Weapon A2: DEFL 2296, ELEV 1311, and TOF 41.1. Scroll through data for the other guns.

25. Record the fire data for Weapon A2 and press END (F4). The CURRENT MISSION MENU appears; scroll up/down to highlight REVIEW SAFETY DATA and press SELECT (F1). The SAFETY DATA screen will appear. Weapon A1 will appear first; press NEXT (F2) to view data for Weapon A2. Ignore the other guns. Record Weapon A2 safety data, Range to Target 2227, and press END (F4). The CURRENT MISSION MENU appears.

26. Scroll up/down to SETUP SHOT/SPLASH and press SELECT (F1). The SHOT/SPLASH screen appears; press USE ALL (F2). The CURRENT MISSION MENU appears again. Press XMIT SHOT (F2) to send the Shot to the FO. The CURRENT MISSION MENU appears. SPLASH appears when the TOF is expired. Press CONTINUE (F4). The CURRENT MISSION MENU appears.

27. Scroll up/down to MESSAGE QUEUE and wait for a message. When an incoming message is received, it will appear on the bottom of the screen. Press CONTINUE (F4) and SELECT (F1). The MESSAGE QUEUE screen appears.

28. Scroll up/down to EOM SURV and press EXPAND (F1) to pull up the message. The EOM & SURVEILLANCE screen will appear. Review and record the information (TARGET TYPE: PERS; TARGET SUBTYPE: PTL; DISPOSITION: NEUTRALIZED; CASUALITIES: 25; and TARGET NUMBER: DC0402). Press PROCESS (F2). The END OF MISSION MENU screen appears.

29. Scroll up/down to RECORD NON-SURVEYED TARGET and press SELECT (F1). The TARGET/KNOWN POINT DATA screen will appear. Press SELECT (F1) and enter the Known Point number of 02. Record the Known Point data (Target Number DC0402, Grid 11821/79564, and Altitude 0150). Press ACCEPT (F2) and then press USE ALL (F2). The CONFIRM ESTIMATE OF ROUNDS FIRED screen appears, indicating 15 rounds fired.

30. Verify number of rounds fired. Press USE ALL (F2). The CONFIRM ESTIMATE OF ROUNDS FIRED screen appears again with 15 rounds and with the message INVENTORY LOW, 85 ROUNDS REMAIN on the bottom of the screen. Press CONTINUE (F4) and the FIRE MISSIONS MENU screen appears.

CHAPTER 3
OPERATOR MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. LUBRICATION.

Lubricate the arm assembly and hinge points of case with general purpose lubricating oil (item 7, Appendix F) as required.

Section II. TROUBLESHOOTING PROCEDURES

3-1.1. GENERAL.

a. Troubleshooting procedures are limited to those listed in the troubleshooting symptom index. Table 3-1 lists the common malfunctions which you may find during the operation or maintenance of the Mortar Ballistic Computer System or its components. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

3-1.2. SYMPTOM INDEX.

NOTE

This symptom index can only be used as a general reference to troubleshooting. Troubleshoot your mortar ballistic computer system in the order shown by the steps. Always do the functional test first in order to verify the symptom. After repair, repeat the functional test to verify proper function.

3-1.2. SYMPTOM INDEX (cont).

3-2. TROUBLESHOOTING PROCEDURES.

INITIAL SETUP

References
   TM 11-5820-890-10-7

NOTE

To verify fault, attempt to reboot the system before performance of any troubleshooting procedures.

Table 3-1. Operator Troubleshooting Procedures.

MALFUNCTION

   TEST OR INSPECTION

      CORRECTIVE ACTION

MORTAR BALLISTIC COMPUTER (MBC)

1. **MORTAR BALLISTIC COMPUTER SYSTEM (MBC) DOES NOT POWER UP.**

WARNING

Ensure power is turned off at power distribution assembly before disconnecting and connecting cables.

  Step 1. Check all cables and cable connectors in MBC system for secure connections.

      Tighten any loose connections.

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

Step 2. Observe power gauge meter in driver's compartment for status of vehicle battery power.

If vehicle power is reading low yellow or red, start/slave the vehicle.

Step 3. Activate vehicle master battery switch. Turn master switch on power distribution assembly (PDA) to DC ON position.

NOTE

In the M577 vehicle, the power switch for the secondary computer is PRN on the PDA.

Step 4. On the PDA, turn CI power switch to ON position. Observe light-emitting diode (LED) on PDA.

- If LED is not illuminated or flickers, cable 3W6 (M1064) or 4W6 (M577) is faulty. Notify unit maintenance.

- If LED illuminates, continue.

Step 5. Turn power switch on mortar ballistic computer (MBC) to ON position.

Step 6. Check that installation of internal batteries is correct.

Install batteries correctly. See paragraph 2-7.

Step 7. If problem persists, notify unit maintenance.

2. MORTAR BALLISTIC COMPUTER (MBC) HAS POWER BUT WILL NOT BOOT TO BANNER SCREEN.

NOTE

There may be some delays when operating in extreme cold weather environment. Allow additional time to power-up.

Step 1. Power down and power up MBC. Verify that MBC boots to banner screen.

Step 2. If MBC does not boot to banner screen, repeat step 1.

Step 3. If MBC still does not boot up, turn off power switch on MBC. Remove batteries and check power level of batteries. See paragraph 2-7.

Step 4. Attempt to boot up MBC without internal batteries.

Step 5. If MBC still does not power up, notify unit maintenance.

3. MORTAR BALLISTIC COMPUTER (MBC) IS LOCKED UP OR NOT RESPONDING.

Step 1. Observe the MBC screen for display of any error message.

If no error message is displayed, proceed to Step 3. If an error message is displayed, continue with Step 2.

3-2. TROUBLESHOOTING PROCEDURES (cont).

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

> **TEST OR INSPECTION**

> > **CORRECTIVE ACTION**

MORTAR BALLISTIC COMPUTER (MBC) (cont)

3. MORTAR BALLISTIC COMPUTER (MBC) IS LOCKED UP OR NOT RESPONDING (cont).

Step 2. Record the error message displayed and attempt to clear the message by clicking on OK using the mouse or pressing the ENTER key on the keyboard. See Appendix I for list of error messages.

> If the MBC does not respond, continue with Step 3.

Step 3. Verify that MBC program is responding properly by changing screens. If screens are locked, then system must be rebooted as follows:

Power-off MBC.
Wait 10 seconds.
Power-up MBC.

If the MBC remains inoperative, notify unit maintenance.

4. FAILURE TO LOAD COMMUNICATION SOFTWARE; "COMMO INITIALIZATION FAILED - DEFAULTING TO MANUAL MODE" MESSAGE APPEARS.

Step 1. Press "Ctrl" "End" to power down.

NOTE

Wait 10 seconds before rebooting computer.

Step 2. Reboot system and load communication setup data.

- If communication data loads, continue with mission.

- If communication data does not load, continue with Step 3.

Step 3. Press "Ctrl" "Del" and press YES (F3). Repeat Step 2 one time only.

If communication software does not load, system is not capable of digital communication. Notify unit maintenance.

5. AFTER SUCCESSFUL BOOT-UP/COMMUNICATION SOFTWARE LOADING, "NO COMMO" ERROR APPEARS WHEN TRANSMITTING OR RECEIVING DIGITAL MESSAGE TRAFFIC.

Step 1. Verify communication setup and perform functional check.

- If system passes functional check, continue with mission.

- If system fails functional check, continue with Step 2.

3-2.2   Change 2

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

Step 2. Verify M31 MBC digital message is received by SINCGARS.

- If message is recorded on signal strength indicator of SINCGARS frequency display, proceed to Step 4.

- If message is not recorded on signal strength indicator of SINCGARS frequency display, continue with Step 3.

Step 3. Check that cable connectors are correctly secured for cable 3W17 (M1064) or 4W7 (M577). Tighten connections as required.

- If problem is corrected, continue with mission.

- If problem persists, notify unit maintenance.

Step 4. Verify SINCGARS operation (voice message traffic confirmation).

- If problem is corrected, continue with mission.

- If voice message traffic cannot be established, perform SINCGARS troubleshooting procedures. Refer to TM 11-5820-890-10-7.

6. KEYBOARD IS NOT OPERATING.

NOTE

Keyboard cable can be checked without powering down.

Step 1. Check for proper connection of keyboard data cable.

Connect keyboard data cable properly.

Step 2. Power down; then power up the MBC and assess if the system reboots and allows use of keyboard.

If the keyboard is inoperative, notify unit maintenance.

3-2. TROUBLESHOOTING PROCEDURES (cont).

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

MORTAR BALLISTIC COMPUTER (MBC) (cont)

7. **LIQUID CRYSTAL DISPLAY (LCD) SCREEN IS FLICKERING.**

    Step 1. Assess if the severity of flickering will interfere with normal operation.

        If flicker is severe, shut down mortar ballistic computer (MBC) by pressing "Ctrl" "End" or "Ctrl" "Del". Wait for message saying it is safe to shut off computer. Wait at least 30 seconds before turning off power switch on MBC.

    Step 2. Again assess severity of flickering.

        If the problem is not corrected and flickering remains severe, notify unit maintenance.

8. **DATA ENTERED INTO MORTAR BALLISTIC COMPUTER (MBC) DOES NOT MATCH DATA DISPLAYED ON LIQUID CRYSTAL DISPLAY (LCD) SCREEN OR DATA DOES NOT APPEAR ON LCD SCREEN.**

NOTE

When NumLk key is pressed and indicator is illuminated, keys with blue numerals and arithmetic functions can be used as a number pad. Inadvertent use of NumLk key may result in inability to perform other desired functions.

    Step 1. Check for activation of NumLk key.

        Press NumLk key to deactivate key.

    Step 2. Check for proper connection and serviceability of cable between LCD and keyboard.

    Step 3. If condition persists, reboot MBC.

    Step 4. If condition persists, notify unit maintenance.

9. **SOFTWARE APPLICATION ERROR IS DISPLAYED.**

    Step 1. Observe error message and determine if it is addressed in Appendix I (Operator Alert and Error Messages).

        If it is not listed, record error message and report to unit maintenance.

    Step 2. Reboot the system as follows:

        Press "Ctrl" "End".
        Click SHUT DOWN.
        Power-off mortar ballistic computer (MBC).
        Wait 10 seconds.
        Power-up MBC.

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

---

10. **WHEN USING INTERNAL BATTERIES AS ONLY POWER SOURCE, MORTAR BALLISTIC COMPUTER (MBC) WILL NOT FUNCTION.**

    Step 1. Observe light-emitting diode (LED) indicators on MBC. Power and battery indicators should be illuminated.

        If indicators are not properly illuminated, charge batteries using vehicle power or AC/DC adapter.

    Step 2. Observe LED indicators for proper illumination. See paragraph 3-5.

        If indicators are not properly illuminated, replace batteries with new fully charged batteries.

    Step 3. Check MBC for proper function.

        If MBC fails to function, notify unit maintenance.

MISCELLANEOUS

11. **INABILITY TO ESTABLISH COMMUNICATIONS NET.**

⚠ WARNING

Ensure power is turned off at power distribution assembly before disconnecting and connecting cables.

    Step 1. Check all cables and cable connectors for secure connections.

        Tighten any loose connections.

    Step 2. Verify that power indicator lights are illuminated on the PDA.

        Cycle switches as necessary to indicate presence of power.

    Step 3. Check for proper setup of SINCGARS radios. Determine that power is ON.

        See Appendix H for proper setup of radios.

    Step 4. Establish voice communications with any other unit on same operating net. After establishment of voice communications, request unit to send digital message.

    Step 5. If troubleshooting a WIRE NET, verify FSK-188B Modulation, DataRate, and Block Mode match all other subscribers on that NET.

3-2. TROUBLESHOOTING PROCEDURES (cont).

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

MISCELLANEOUS (cont)

11. INABILITY TO ESTABLISH COMMUNICATIONS NET (cont).

Step 6. If troubleshooting a SINCGARS NET using NRZ Modulation, proceed as follows:

    a. Verify NRZ Modulation, DataRate, and Block Mode on screen match all other subscribers on that NET, verbally.

    b. Verify DataRate selected matches SINCGARS DataRate.

    c. Verify ComsecMode matches Comsec setting on SINCGARS.

    d. Verify fhMode on screen matches Mode setting on SINCGARS.

Step 7. If troubleshooting a SINCGARS FSK NET, proceed as follows:

    a. Verify FSK-188B Modulation, DataRate, and Block Mode on screen match all other subscribers on that NET, verbally.

    b. Verify DataRate is AD1 on SINCGARS.

    c. Verify ComsecMode matches Comsec setting on SINCGARS.

    d. Verify fhMode on screen matches Mode setting on SINCGARS.

Step 8. If using Cipher_Text (CT) or Freq_Hop (fh), verify TimeHack with other SINCGARS on the NET.

Step 9. If digital message is not established, revert to voice method of control to accomplish mission. Notify unit maintenance or communication personnel.

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

> **TEST OR INSPECTION**
>
> > **CORRECTIVE ACTION**

12. ESTABLISHED DIGITAL COMMUNICATIONS FAIL.

Step 1. Resend message and observe signal strength indicator on SINCGARS frequency display.

- If no signal, continue with Step 2.

- If signal is observed, proceed to Step 3.

Step 2. Check connectors on cable 3W17 (M1064) or 4W7 (M577) between mortar ballistic computer (MBC) and SINCGARS to ensure proper connection. Resend message.

- If message is received, continue with mission.

- If problem still exists, continue with Step 3.

Step 3. Verify SINCGARS operation by voice message traffic.

- If SINCGARS has voice message capability, continue with Step 4.

- If SINCGARS has no voice message capability, perform SINCGARS troubleshooting procedures. Refer to TM 11-5820-890-10-7.

Step 4. By voice communication, request digital message traffic be sent to verify M31 MBC digital communication capability.

- If digital communication capability exists, continue with mission.

- If problem persists, notify supervisor.

13. ON POWER DISTRIBUTION ASSEMBLY (PDA), MASTER SWITCH LIGHT-EMITTING DIODE (LED) FAULT INDICATOR IS ILLUMINATED WITH AMBER LIGHT.

<div align="center">

WARNING

</div>

Ensure power is turned off at power distribution assembly before disconnecting and connecting cables.

Step 1. Master switch LED fault indicator can illuminate if PDA is operating outside its environmental range of -40 to +185 °F (-40 to 85 °C). Cut power to PDA and allow PDA to cool. If PDA is receiving AC power, disconnect AC power cable to PDA. If PDA is receiving vehicle power, toggle PDA Master switch off (down) and remove the vehicle power cable.

Step 2. If PDA is receiving vehicle power, check position of PDA master power switch.

Turn power switch off and on to reset unit.

3-2. TROUBLESHOOTING PROCEDURES (cont).

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

MISCELLANEOUS (cont)

13. ON POWER DISTRIBUTION ASSEMBLY (PDA), MASTER SWITCH LIGHT-EMITTING DIODE (LED) FAULT INDICATOR IS ILLUMINATED WITH AMBER LIGHT (cont).

NOTE

If AC power is available and use of AC power is desired, connect AC cable to PDA to assist fault isolation of PDA, cables, or vehicle batteries.

Step 3. Check connection of cable 3W17 (M1064) or 4W7 (M577) to PDA connector J3.

Connect cable to PDA connector J3 properly.

Step 4. Check connection of MBC cable to indicated Line Replaceable Unit (LRU).

Connect cable to LRU properly.

Step 5. Turn power on at PDA. Observe illumination of LED indicator and FAULT indicator.

If FAULT indicator is illuminated or other LED is flashing, notify unit maintenance.

14. WHEN USING EXTERNAL POWER, MORTAR BALLISTIC COMPUTER (MBC) POWER LIGHT-EMITTING DIODE (LED) INDICATOR ILLUMINATES WITH AMBER LIGHT.

NOTE

If POWER indicator illuminates with amber light, MBC is not receiving external power. Only battery power is used.

Step 1. Ensure that power distribution assembly (PDA) master switch and CI LED indicators on PDA are illuminated with green light. If indicators are not illuminated with green light, perform Malfunction 1.

Step 2. If condition still persists, toggle PDA switches as needed to ON position.

NOTE

If vehicle power drops below 18VDC, MBC will automatically switch to internal battery power. POWER LED indicator on MBC will change from green to amber.

Step 3. Observe power gauge meter in driver's compartment for status of vehicle battery power.

If vehicle power is reading low yellow or red, start/slave the vehicle.

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

    Step 4. Check for proper connections of cable 3W17 (M1064) or cables 4W7 and 34W2 (M577) between PDA and MBC.

        Tighten connectors as needed.

    Step 5. Connect AC adapter cable to PDA. Observe that POWER LED indicator on MBC illuminates with green light.

        If problems persist, notify unit maintenance.

15. ON POWER DISTRIBUTION ASSEMBLY (PDA), GREEN LIGHT-EMITTING DIODE (LED) INDICATOR FOR MORTAR BALLISTIC COMPUTER (CI TOGGLE SWITCH) IS NOT ILLUMINATED OR FLICKERS.

<div align="center">

WARNING

</div>

Ensure power is turned off at power distribution assembly before disconnecting and connecting cables.

<div align="center">

NOTE

</div>

If AC power is available and use of AC power is desired, connect AC cable to PDA to assist fault isolation of PDA, cables, or vehicle batteries.

    Step 1. Disconnect cable 3W17 (M1064) or 4W7 (M577) from PDA. Turn power to CI toggle switch on at PDA. Observe LED on PDA.

        ● If LED is not illuminated or flickers, PDA is faulty. Notify unit maintenance.

        ● If LED illuminates, reconnect cable to PDA. The mortar ballistic computer (MBC) or cable is faulty. Continue with Step 2.

    Step 2. Disconnect P6 connector of cable 3W17 (M1064) or 4W7 (M577) from J1 connector of MBC. Observe LED on PDA.

        ● If LED is not illuminated or flickers, cable 3W17 or 4W7 is faulty. Notify unit maintenance.

        ● If LED illuminates, MBC is faulty. Notify unit maintenance.

3-2. TROUBLESHOOTING PROCEDURES (cont).

Table 3-1. Operator Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

MISCELLANEOUS (cont)

16. **ON POWER DISTRIBUTION ASSEMBLY (PDA), GREEN LIGHT-EMITTING DIODE (LED) PRN INDICATOR FOR SECONDARY MORTAR BALLISTIC COMPUTER (MBC) IS NOT ILLUMINATED OR FLICKERS.**

> ### WARNING

Ensure power is turned off at power distribution assembly before disconnecting and connecting cables.

NOTE

If AC power is available and use of AC power is desired, connect AC cable to PDA to assist fault isolation of PDA, cables, or vehicle batteries.

  Step 1. Disconnect cable 34W2 from PDA to secondary MBC. Turn power for MBC on at PDA (PRN toggle switch). Observe LED on PDA.

- If LED is not illuminated or flickers, PDA is faulty. Notify unit maintenance.

- If LED illuminates, reconnect cable 34W2 to PDA. The MBC or cable is faulty. Continue with Step 2.

  Step 2. Disconnect P1 connector of cable 34W2 from J1 connector of secondary MBC (M577). Observe LED on PDA.

- If LED is not illuminated or flickers, cable 34W2 is faulty. Notify unit maintenance.

- If LED illuminates, MBC is faulty. Notify unit maintenance.

3-3. CABLING INTERFACES.

Table 3-2 provides a list of the external interface cables supplied with the MBC, and their functions.

Table 3-2. MBC Communication/Power Interface Cables.

Cable	Purpose
P/N 12992861 NSN 5995-01-485-3472 Cable, Special Purpose (Power/Communication) (4W7)	Interfaces MBC primary computer with power distribution assembly (PDA) and two SINCGARS radios in M577 Fire Direction Center.
P/N 12992865 NSN 5995-01-485-3471 Cable, Special Purpose (34W2)	Interfaces MBC secondary computer with PDA in M577 Fire Direction Center.
P/N 12992860 NSN 5995-01-485-3474 Cable, Special Purpose (Vehicle Battery) (4W6)	Interfaces PDA with vehicle's battery terminals in M577 Fire Direction Center.
P/N 12992871 NSN 5995-01-485-3466 Cable, Special Purpose (Power/Communication) (3W17)	Interfaces MBC computer with PDA and two SINCGARS radios in M1064 Carrier.
P/N 12992867 NSN 5995-01-485-3469 Cable, Power, Vehicle (3W6)	Interfaces PDA with vehicle's battery terminals in M1064 Carrier.
P/N 12992872 NSN 5995-01-485-3467 Cable, Power, VAC (34W4)	Interfaces PDA with VAC power source in both M577 Fire Direction Center and M1064 Carrier.
P/N 12992896 NSN 5995-01-793-3401 AC/DC Adapter	Interfaces MBC computer with VAC power source.

Section III. OPERATOR'S MAINTENANCE PROCEDURES

3-4. INTRODUCTION.

Maintenance procedures for the MBC consist of periodic cleaning of the MBC unit and removal/installation of the internal batteries.

3-5. BATTERY MAINTENANCE.

This task covers:

    a. Replacement of Batteries   **b.** Conditioning of Batteries   **c.** Normal Use of Batteries

REPLACEMENT OF BATTERIES

WARNING

To prevent electrical shock, ensure power is turned off at power distribution assembly before battery compartment is opened.

CAUTION

A constant 12 VDC is present on the MBC connector pins whenever the battery is installed. To prevent accidental shorting of pins and depletion of battery, ensure that connectors are capped when not in use.
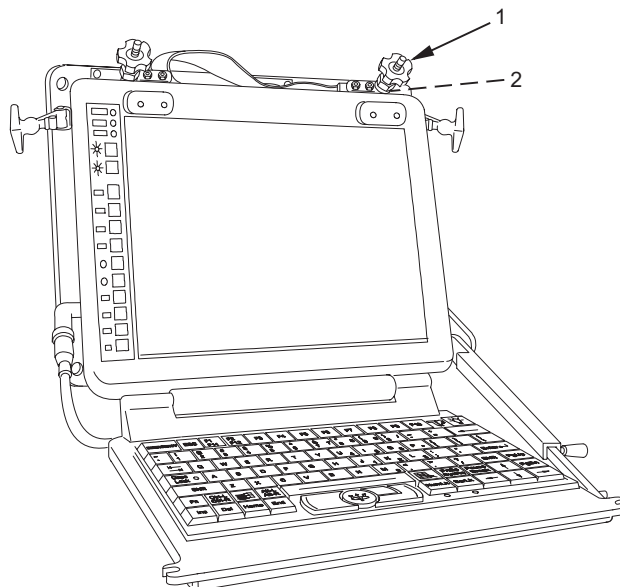
1.   Loosen and raise retainer assembly (1) to gain access to door latch (2).

3-5. BATTERY MAINTENANCE (cont).
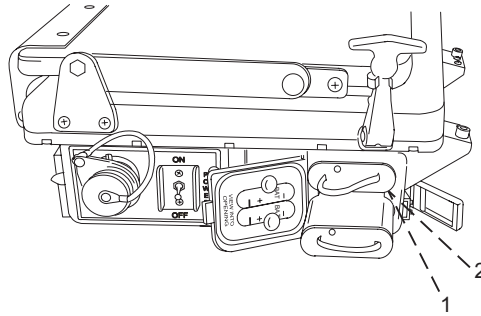
2. Lift door latch (2) and open battery access door (3). Swing battery access door to left.

3. Grasp pull-tab on battery (4) and pull to remove battery from battery compartment (5). Repeat for second battery (4).
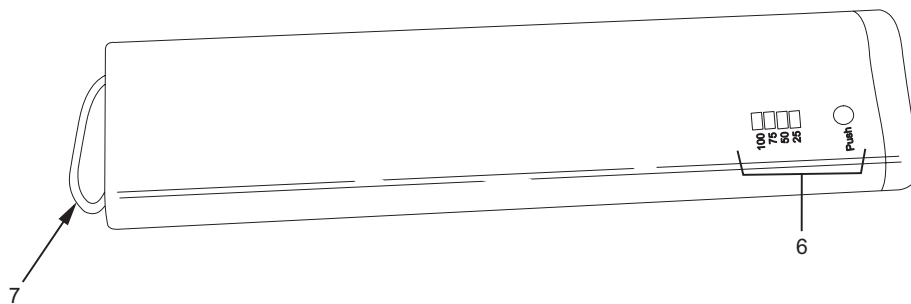
NOTE

Ensure that new batteries are fully charged before installation. Battery power can be determined by pushing button and reading battery indicator gauge.

4. Insert two new batteries (4) into battery compartment (5) with battery fuel gauge (6) visible on top and pull-tab (7) facing out. Close battery access door (3) and secure with door latch (2).

CONDITIONING OF BATTERIES

NOTE

The MBC computer contains two rechargeable nickel metal hydride (NiMH) batteries. New batteries must be properly conditioned to attain maximum output power. Deep cycling is the process of fully discharging and recharging the batteries.

MBC must have external power and be turned on to charge batteries.

Ensure that new batteries are fully charged before installation.
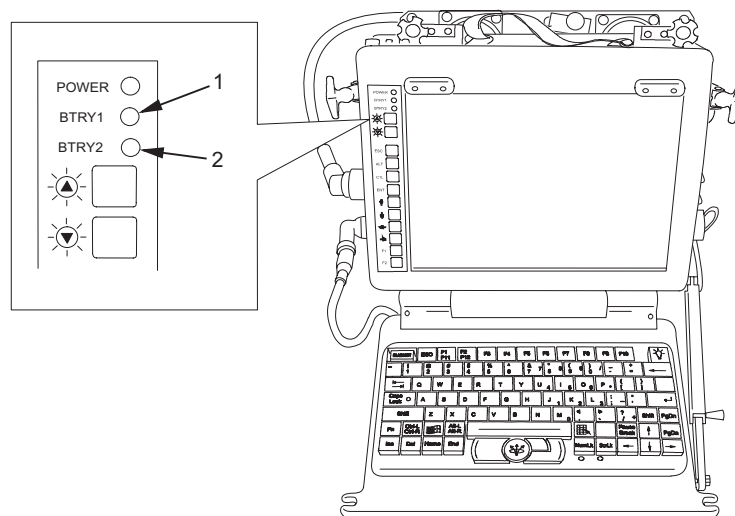
1. To condition a new battery for maximum performance, charge the battery to 100% capacity by use of the internal battery charger. The J1 connector on the computer must be connected to the power distribution assembly (PDA) or the AC/DC adapter and the computer must be turned on.

WARNING

Ensure power is turned off at power distribution assembly before disconnection of cable.

CAUTION

To avoid corruption of software, ensure software is not running when fully discharging batteries.

2. To fully discharge batteries, ensure external power source is off. Perform normal shutdown of software. Allow computer to run, using internal battery power only, until BTRY1 indicator (1) and BTRY2 indicator (2) lights change from green to amber and then go blank. Verify that batteries are fully discharged, using battery indicator gauge.

3. Repeat the battery cycling at least three times prior to operational use of the battery.

4. If shortened battery life is noticed during later use, repeat the battery cycling. If battery life is not improved, replace the battery.

3-5. BATTERY MAINTENANCE (CONT).

NORMAL USE OF BATTERIES
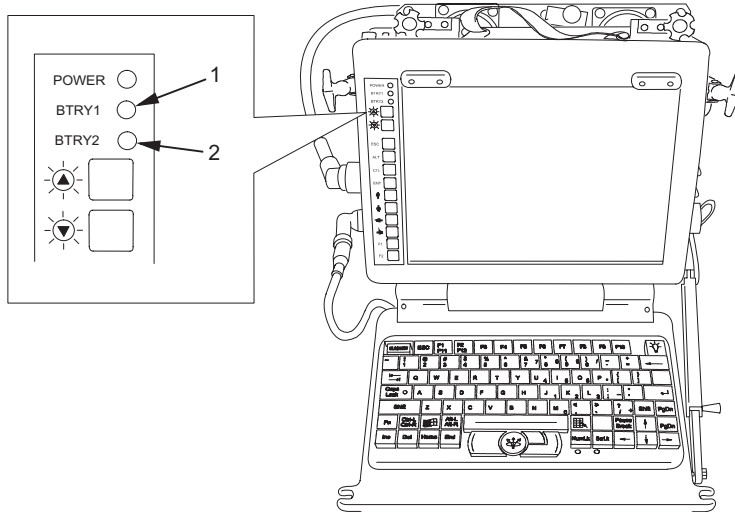
NOTE

Battery 1 is on the bottom of the battery compartment and Battery 2 is on the top.

1. Observe BTRY1 indicator (1) and BTRY2 indicator (2) to determine charging status of batteries for the following conditions.

   a. MBC is externally powered:

CAUTION

If both batteries are at 25% capacity or less, do not attempt to boot up system using external power until batteries have been removed. Failure to remove batteries will result in equipment damage.

   (1) When indicators are green, batteries are fully (75% to 100%) charged.

NOTE

Charging times vary according to operating conditions.

When using vehicle power, monitor power gauge meter to ensure gauge indicates sufficient battery power is present to start vehicle.

   (2) When indicators are amber, batteries are 25% to 75% charged (batteries are charging).

   (3) When indicators are not illuminated, battery charge is below 25% (batteries are charging).

b. MBC is internally powered (batteries only):

NOTE

Battery life can be expected to be approximately two hours of usage under normal conditions.

(1) When indicators are green, batteries are fully (75% to 100%) charged (batteries are draining).

(2) When indicators are amber, batteries are 25% to 75% charged (batteries are draining). When both indicators illuminate amber, replace batteries or connect to external power.

(3) When indicators are not illuminated, battery charge is below 25% and MBC will not operate.

c. If a battery is not installed, the appropriate battery indicator will not illuminate.

2. To conserve power and extend battery life, follow these guidelines.

a. If tactical situation allows, turn off the computer when the system will not be needed for a period of time.

b. Deep cycle (fully discharge and recharge) the batteries every four to six weeks.

c. Replace batteries when necessary.

d. If the computer is to be stored for more than 30 days, remove the batteries.

e. Set a faster time-out (in system setup) for display/display backlight sleep mode.

f. Set a faster time-out (in system setup) for central processing unit (CPU) sleep mode.

CHAPTER 4
UNIT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS; TOOLS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

4-1. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

No special tools are required for the MBC.

4-3. REPAIR PARTS.

Repair parts are listed and illustrated in Appendix C.

Section II. SERVICE UPON RECEIPT

4-4. SERVICE UPON RECEIPT OF MATERIEL.

The MBC computer should be inspected, both as a packaged unit and after unpacking, for any signs of shipping damage, such as dents, breaks, water (moisture) damage, or any evidence of general mishandling. If any damage is discovered, notify Direct Support Maintenance.

Section III. TROUBLESHOOTING

4-4.1. GENERAL.

   a. Troubleshooting procedures are limited to those listed in the troubleshooting symptom index. Table 4-1 lists the common malfunctions which you may find during the operation or maintenance of the Mortar Ballistic Computer System or its components. You should perform the tests/inspections and corrective actions in the order listed.

   b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

4-4.2. SYMPTOM INDEX.

NOTE

This symptom index can only be used as a general reference to troubleshooting. Troubleshoot your mortar ballistic computer system in the order shown by the steps. Always do the functional test first in order to verify the symptom. To verify deficiency of suspect component, install and test in another vehicle (if available). After repair, repeat the functional test to verify proper function. To ensure full functionality of system, install repaired line replaceable unit (LRU)/component on vehicle and perform all procedures necessary to prove full mission capability.

4-5. TROUBLESHOOTING PROCEDURES.

INITIAL SETUP

Tools and Special Tools
    Electronic Equipment Tool Kit, TK101GISSUE6
    Shop Set, Small Arms: Field Maintenance, Basic, Less Power, SC 4933-95-A11

References
    TM 9-2350-261-20
    TM 9-2350-277-20

Table 4-1. Unit Troubleshooting Procedures.

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

NOTE

To confirm fault of any line replaceable unit (LRU), ensure that cable connections are secure before proceeding with other checks.

To verify fault, attempt to reboot the system before performance of any troubleshooting procedure.

If alternating current (AC) power is available and use of AC power is desired, connect AC cable to power distribution assembly (PDA), cables, or vehicle batteries.

MORTAR BALLISTIC COMPUTER (MBC) SYSTEM

1. NO POWER TO POWER DISTRIBUTION ASSEMBLY (PDA) (M577 AND M1064).

WARNING

Ensure power is turned off at power distribution assembly before disconnecting and connecting cables.

To avoid personnel injury due to electrical shock, use insulated jumper wires when checking pins for voltage.

  Step 1. Perform voltage check of cable 4W6 (M577) or cable 3W6 (M1064) from vehicle battery to PDA. See Appendix J.

      ● If power is present, replace PDA. See paragraph 4-6 (M577) or paragraph 4-12 (M1064).

      ● If no power is present, continue.

  Step 2. Perform continuity check of cable 4W6 (M577) or cable 3W6 (M1064). See Appendix J.

      ● If continuity check fails, replace cable and continue. See paragraph 4-10 (M577) or paragraph 4-14 (M1064).

      ● If continuity check passes, refer to TM 9-2350-277-20 (M1064) or TM 9-2350-261-20 (M577).

  Step 3. Perform functional test of PDA.

      ● If power is present, continue operations.

      ● If no power is present, refer to TM 9-2350-277-20 (M1064) or TM 9-2350-261-20 (M577).

4-5. TROUBLESHOOTING PROCEDURES (cont).

Table 4-1. Unit Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

MORTAR BALLISTIC COMPUTER (MBC) SYSTEM (cont)

2. **NO POWER FROM POWER DISTRIBUTION ASSEMBLY (PDA) TO MORTAR BALLISTIC COMPUTER (MBC) (M577 AND M1064).**

WARNING

Ensure power is turned off at power distribution assembly before disconnecting and connecting cables.

To avoid personnel injury due to electrical shock, use insulated jumper wires when checking pins for voltage.

  Step 1. Perform voltage check of cable to MBC. See Appendix J.

- If power is present, replace MBC.

- If no power is present, continue.

  Step 2. Perform continuity check of cable. See Appendix J.

If continuity check fails, replace faulty cable and continue.

  Step 3. Perform functional test of MBC.

- If MBC functions properly, continue operations.

- If MBC does not function properly, replace MBC.

MORTAR BALLISTIC COMPUTER (MBC)

3. **MORTAR BALLISTIC COMPUTER (MBC) HAS POWER BUT WILL NOT BOOT UP, IS LOCKED UP, NO SOFTWARE APPEARS, KEYBOARD WILL NOT OPERATE, OR LIQUID CRYSTAL DISPLAY (LCD) FLICKERS (M577 AND M1064).**

  Step 1. Confirm that MBC does not boot up, is locked up, or software is not available by performing full system restart.

  Step 2. Recycle power. Perform functional test of MBC.

- If function test passes, return MBC to service.

- If function test fails, notify direct support maintenance.

Table 4-1. Unit Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

---

4. **MORTAR BALLISTIC COMPUTER (MBC) HAS POWER BUT WILL NOT BOOT TO BANNER SCREEN.**

    Step 1. Confirm operator's troubleshooting procedures. See paragraph 3-2, malfunction 2.

- If MBC boots to banner screen, return MBC to service.

- If MBC fails to boot to banner screen, continue with Step 2.

    Step 2. Power down MBC. Remove hard drive access cover and check for proper seating of hard drive. See paragraph 4-9.

    Step 3. Recycle power. Perform functional test of MBC.

- If function test passes, return MBC to service.

- If function test fails, notify direct support maintenance.

5. **FAILURE TO LOAD COMMUNICATION SOFTWARE; "COMMO INITIALIZATION FAILED - DEFAULTING TO MANUAL MODE" MESSAGE APPEARS.**

    Step 1. Confirm operator's troubleshooting procedures. See paragraph 3-2, malfunction 4.

- If communication software loads, return MBC to service.

- If failure occurs again, continue with Step 2.

    Step 2. Power down MBC. Remove TCIM access cover and check for proper seating of TCIM card. See paragraph 4-9.

    Step 3. Recycle power. Perform functional test of MBC.

- If function test passes, return MBC to service.

- If function test fails, notify direct support maintenance.

6. **AFTER SUCCESSFUL BOOT-UP/COMMUNICATION SOFTWARE LOADING, "NO COMMO" ERROR APPEARS WHEN TRANSMITTING OR RECEIVING DIGITAL MESSAGE TRAFFIC OR ESTABLISHED DIGITAL COMMUNICATIONS FAIL.**

    Step 1. Confirm operator's troubleshooting procedures. See paragraph 3-2, malfunction 5 or malfunction 12.

    Step 2. Perform continuity check of cable 3W17 (M1064) or 4W7 (M577). See Appendix J.

- If no continuity exists, replace cable. See paragraph 4-10 (M577) or paragraph 4-14 (M1064).

- If continuity exists, notify direct support maintenance.

4-5. TROUBLESHOOTING PROCEDURES (cont).

Table 4-1. Unit Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

MORTAR BALLISTIC COMPUTER (MBC) SYSTEM (cont)

7. **DATA ENTERED INTO MORTAR BALLISTIC COMPUTER (MBC) DOES NOT MATCH DATA DISPLAYED ON LIQUID CRYSTAL DISPLAY (LCD) SCREEN OR DATA DOES NOT APPEAR ON LCD SCREEN.**

    Step 1. Confirm operator's troubleshooting procedures. See paragraph 3-2, malfunction 8.

- If problem does not exist, return MBC to service.

- If problem persists, notify direct support maintenance.

MISCELLANEOUS

8. **ON POWER DISTRIBUTION ASSEMBLY (PDA), GREEN LIGHT-EMITTING DIODE (LED) INDICATOR FOR MORTAR BALLISTIC COMPUTER (MBC) IS NOT ILLUMINATED OR FLICKERS, FAULT INDICATOR IS ILLUMINATED WITH AMBER LIGHT, OR MBC DOES NOT POWER UP.**

    Step 1. Confirm operator's troubleshooting procedures. See paragraph 3-2, malfunction 16 or malfunction 17.

- If LED is illuminated properly, continue with mission.

- If problem persists, continue with Step 2.

    Step 2. Perform continuity check of cable 3W17 (M1064) or 4W7 (M577). See Appendix J.

- If no continuity exists, replace cable. See paragraph 4-10 (M577) or paragraph 4-14 (M1064).

- If continuity exists, replace PDA. See paragraph 4-6 (M577) or paragraph 4-12 (M1064).

All data on page 4-5 deleted.

Section IV. MAINTENANCE PROCEDURES FOR M577 VEHICLE

4-6. POWER DISTRIBUTION ASSEMBLY.

This task covers:

    a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
    Self-locking nut (4) MS17830-5C

REMOVAL
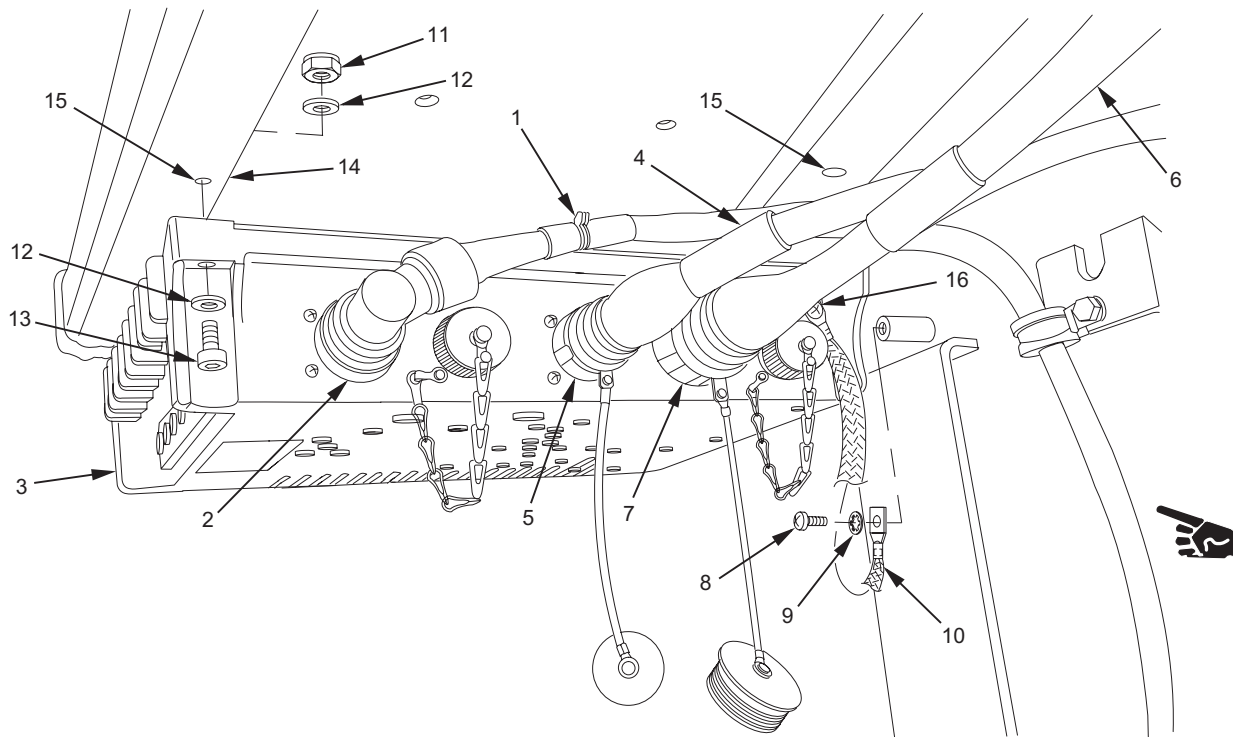
WARNING

Ensure power is removed from system before power distribution assembly is removed.

1.   Disconnect power cable 34W2 (1) from J1 connector (2) on power distribution assembly (PDA) (3).

2.   Disconnect power/data cable 4W7 (4) from J3 connector (5) on PDA (3).

3. Disconnect power cable 4W6 (6) from J4 connector (7) on PDA (3).

3.1. Remove machine screw (8), internal-tooth washer (9), and ground strap (10) from vehicle standoff.

3.2. Remove ground strap (10) from PDA (3).

4. Remove four self-locking nuts (11), eight flat washers (12), four socket head capscrews (13), and PDA (3) from forward driver's side shelf (14). Discard self-locking nuts.

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

NOTE

If power distribution assembly is being installed in vehicle for the first time, proceed with step 1. If power distribution assembly is being installed in previously-modified vehicle, proceed to step 4.

1. Position PDA (3) under forward driver's side shelf (14). Place approximately 11.5 in. (29.2 cm) to right of shelf hanger and approximately 1.0 in. (2.5 cm) from rear of shelf.

2. Using PDA (3) as template, mark locations for four holes (15) on forward driver's side shelf (14).

WARNING

When drilling metal, always wear safety glasses for eye protection. Use a disposable face mask when dust and/or vapors are present.

3. Using drill and 5/16 in. (0.79 cm) drill bit, drill four through holes in lower lip of forward driver's side shelf (14).

WARNING

Ensure power is removed from system before power distribution assembly is installed.

4. Position PDA (3) under forward driver's side shelf (14) and align holes. Install four socket head capscrews (13), eight flat washers (12), and four new self-locking nuts (11).

4.1. Using thumbscrew (16), install ground strap (10) to PDA (3).

4.2. Install other end of ground strap (10) to vehicle standoff, using internal-tooth washer (9) and machine screw (8).

5. Connect power cable 4W6 (6) to J4 connector (7) on PDA (3).

6. Connect power/data cable 4W7 (4) to J3 connector (5) on PDA (3).

7. Connect power cable 34W2 (1) to J1 connector (2) on PDA (3).

4-7. CABLE BRACKET.

This task covers:

    a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
    Self-locking nut (2) M45913/1-4CS3

REMOVAL
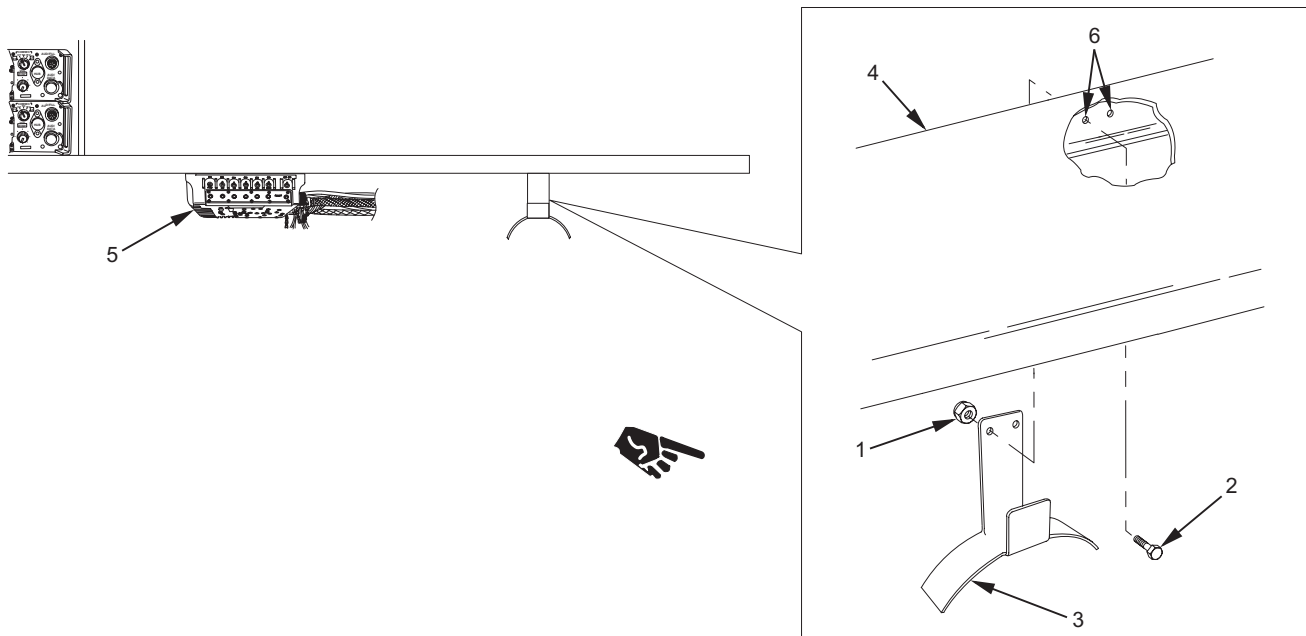
Remove two self-locking nuts (1), two hexagon head capscrews (2), and cable bracket (3) from rear of forward driver's side shelf (4). Discard self-locking nuts.

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

NOTE

If cable bracket is being installed in vehicle for the first time, proceed with step 1. If cable bracket
is being installed in previously-modified vehicle, proceed to step 4.

1. Place cable bracket (3) to right of power distribution assembly (PDA) (5), against rear lip of forward driver's
    side shelf (4) and approximately 36.0 in. (91.4 cm) to right of shelf hanger.

2. Using cable bracket (3) as template, mark locations for two holes (6). Remove cable bracket.

WARNING

When drilling metal, always wear safety glasses for eye protection. Use a disposable face mask
when dust and/or vapors are present.

3. Using drill and 1/4 in. (0.64 cm) drill bit, drill two through holes (6) in rear lip of forward driver's side shelf (4).

4. Position cable bracket (3) at rear of forward driver's side shelf (4) and align holes.

5. Install two hexagon head capscrews (2) and two new self-locking nuts (1).

4-8. COMPUTER TABLE TOP MOUNTS.

This task covers:

a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
    Self-locking nut (6) M45913/1-4CS3

Personnel Required
    Two

REMOVAL
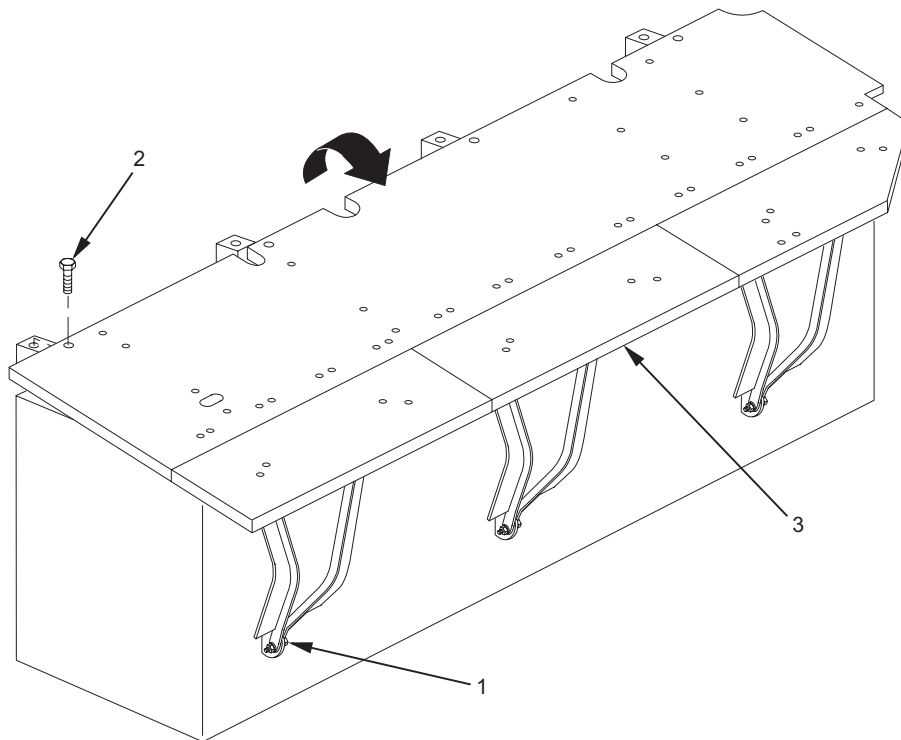
1. If required to allow access, loosen attaching hardware at hinge points (1). Remove four bolts (2) and tilt table top (3).
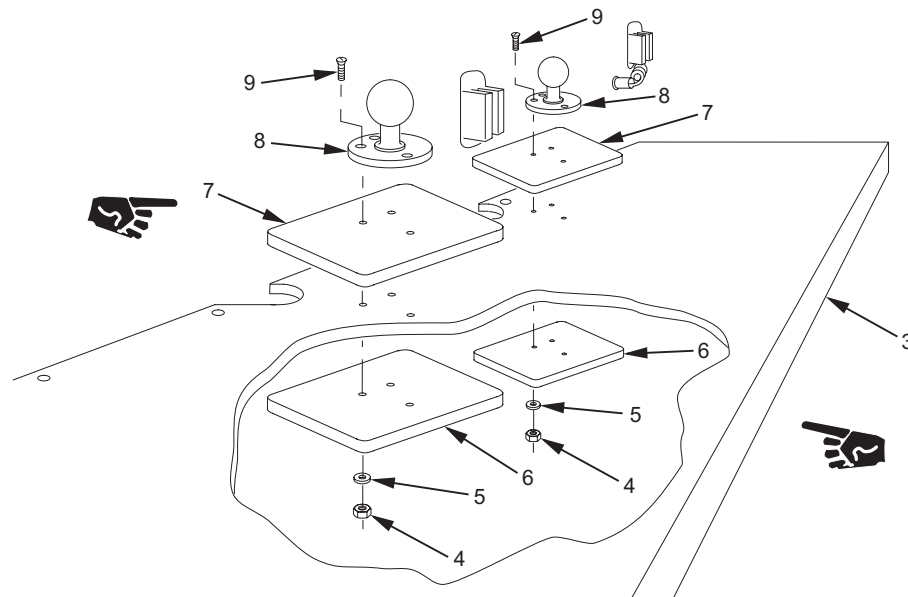
2. Remove six self-locking nuts (4), six flat washers (5), two bottom ram mounting plates (6), two top ram mounting plates (7), two ram mounts (8), and six countersunk capscrews (9) from table top (3). Discard self-locking nuts.

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

4-8. COMPUTER TABLE TOP MOUNTS (cont).

INSTALLATION

NOTE

If computer table top mounts are being installed in vehicle for the first time, proceed with step 1.
If computer table top mounts are being installed in previously-modified vehicle, proceed to step 5.

WARNING

Ensure power is turned off at power distribution assembly before connection of cables.

NOTE

Ensure that cable 34W2 will reach selected positions of both computer table top mounts.

1. Connect power cable 34W2 to J1 connector on power distribution assembly (PDA) and determine that cable will reach position of both computers.
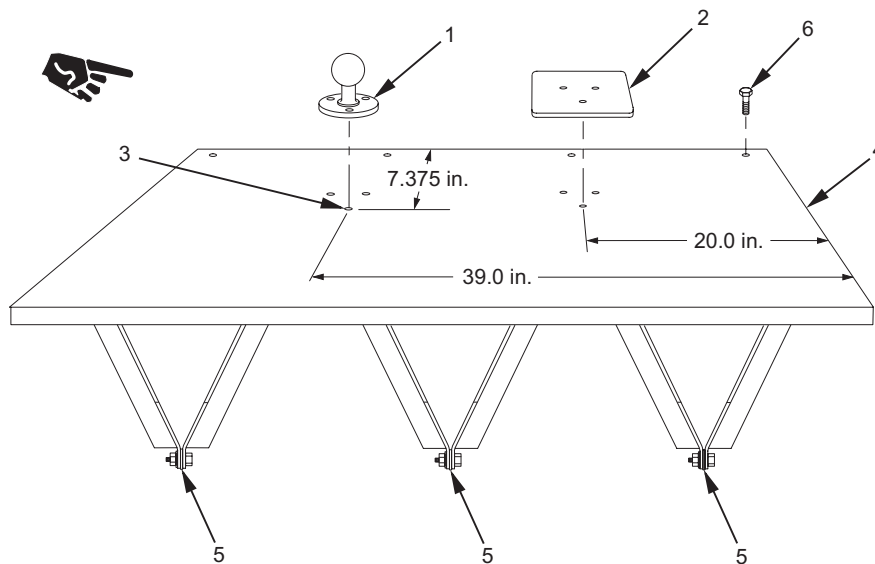
WARNING

To avoid possible rupture of fuel tank and personnel injury, do not drill any holes prior to tilting of table top.

2. Using ram mount (1) or top ram mounting plate (2) as a template, mark locations for six holes (3) on table top (4). Position template with single hole facing near edge of table top. Mark single hole positions at approximately 20.0 in. (50.8 cm) and 39.0 in. (99.1 cm) from right edge of table and 7.375 in. (18.73 cm) from rear edge of table.

NOTE

Bottom ram mounting plate for left side may be trimmed to fit beside gas tank bracket.

WARNING

Use two persons to support table top when drilling holes.

When drilling metal, always wear safety glasses for eye protection. Use a disposable face mask when dust and/or vapors are present.

3. Loosen attaching hardware at hinge points (5). Using 9/16 wrench and 9/16 socket, remove four bolts (6) from table top (4). Tilt table top forward.

4. Using drill and 3/16 in. (0.48 cm) drill bit, drill six through holes (3) in table top (4).
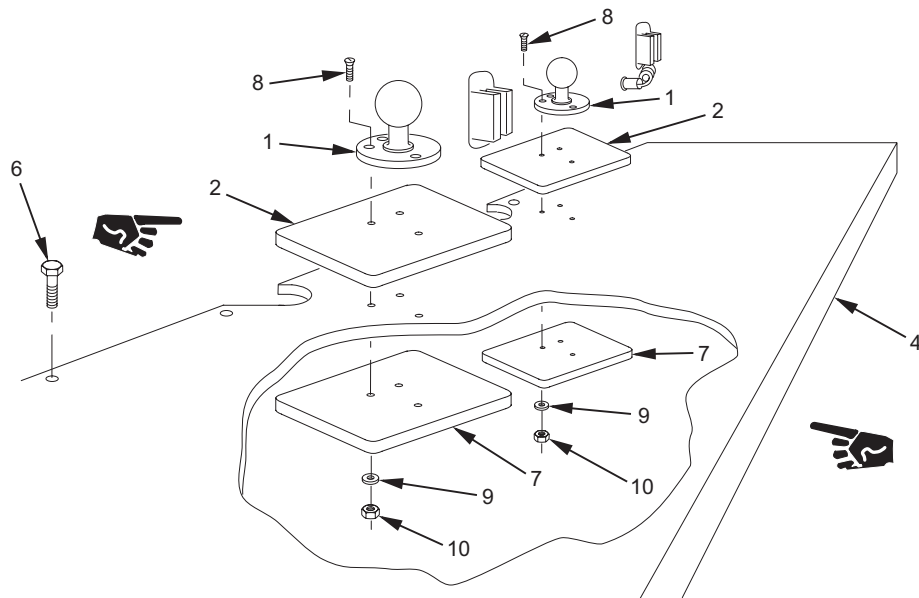
5. Position two bottom ram mounting plates (7), two top ram mounting plates (2), and two ram mounts (1) on table top (4). Secure with six countersunk capscrews (8), six flat washers (9), and six new self-locking nuts (10).

6. Reposition table top (4). Install four bolts (6). Tighten attaching hardware at hinge points (5).

4-9. COMPUTER AND COMPUTER MOUNTING BRACKET.

This task covers:

a. Removal **b.** Disassembly **c.** Inspection/Repair **d.** Reassembly **e.** Installation

INITIAL SETUP

Tools/Special Tools
Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
Siliprene adhesive (item 1.1, Appendix F)
Soft carrying case (item 3, Appendix D (Basic Issue Items))
Thread-locking compound (item 4, Appendix F)

REMOVAL

NOTE

Procedure is written for one computer but applies to both.
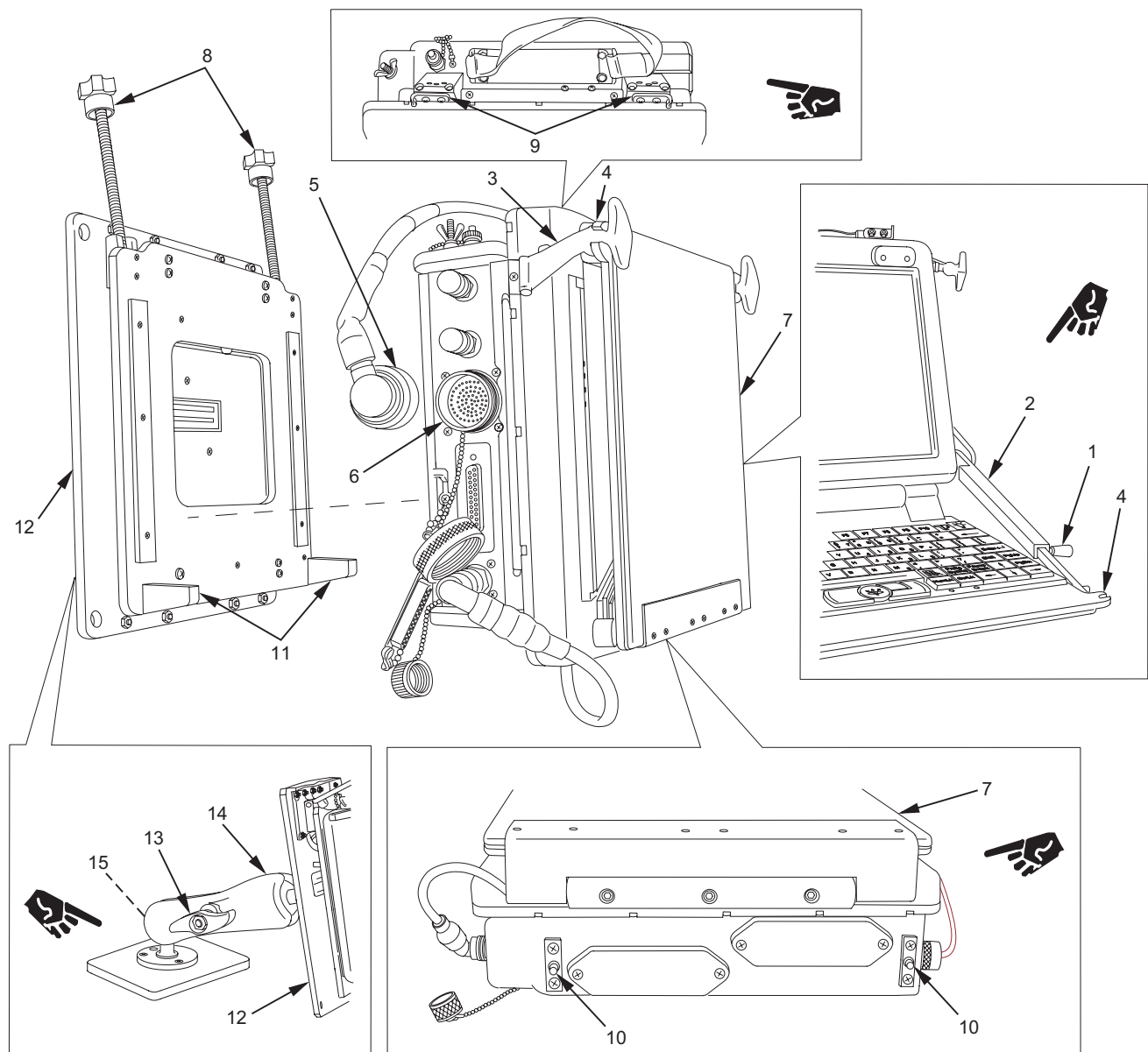
1. Release spring-loaded latch (1) on arm assembly (2) and fold keyboard against display area. Pull two rubber fasteners (3) into two U-shaped extensions (4) to secure keyboard.

WARNING

Ensure power is turned off at power distribution assembly before computers are removed.

CAUTION

To prevent equipment damage, do not handle computer by cable connecting keyboard to display area.

2. Disconnect cable connector (5) from J1 connector (6) on computer (7).

4-9. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

3. Loosen knobs on two retainer assemblies (8) and release from two locking fixtures (9).

4. Lift computer (7) and remove two guide pins (10) from two guide pin receptacles (11) of computer mounting bracket (12).

CAUTION

To avoid damage to keyboard cable connector, disconnect cable and install dust protective cap prior to placement of computer into carrying case.

5. Place computer (7) in soft carrying case (item 3, Appendix D) and store per unit SOP.

6. If damaged, loosen locking knob (13) on ram arm (14) and remove computer mounting bracket (12).

7. If damaged, remove ram arm (14) from ram mount (15).

DISASSEMBLY

NOTE
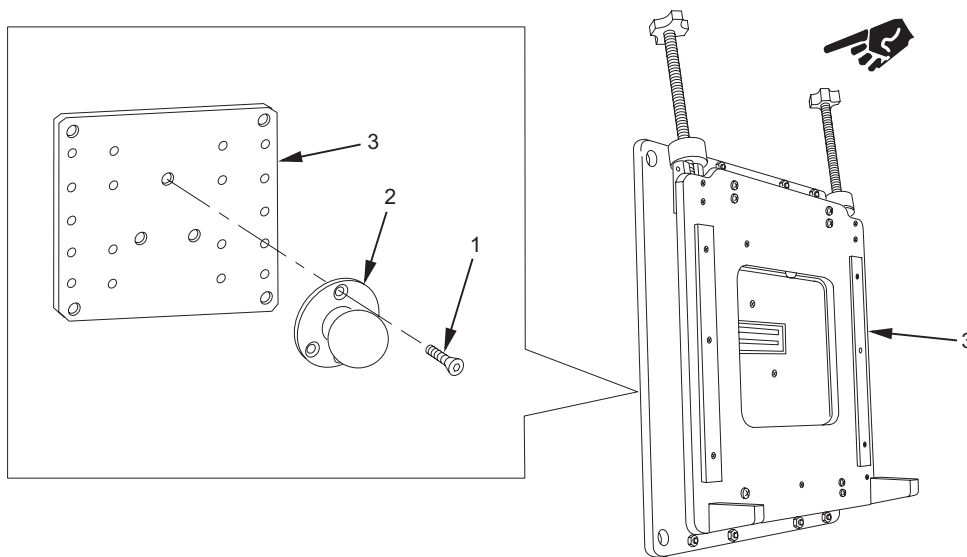
Steps 1 through 3 apply to disassembly of computer mounting bracket.

1. Deleted.

2. Deleted.

3. If damaged, remove three countersunk capscrews (1) and ram mount (2) from rear of computer mounting bracket (3).

NOTE

Steps 4 through 8 apply to disassembly of computer.

4.   Remove internal batteries from computer (4). Refer to paragraph 3-5.

NOTE

Steps 5 and 6 apply to TCIM access cover.
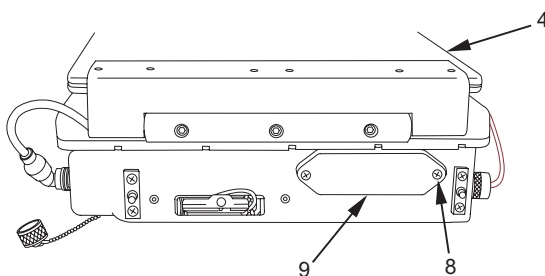
5.   Loosen two captive screws (5) and remove TCIM access cover (6) from computer (4).

6.   Inspect bumper (7) for serviceability. If damaged, replace TCIM access cover (6).

NOTE

Steps 7 and 8 apply to hard drive access cover.

7.   Loosen two captive screws (8) and remove hard drive access cover (9) from computer (4).

4-9. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

8.   Inspect bumper (10) for serviceability. If damaged, replace hard drive access cover (9).

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

REASSEMBLY

NOTE

Steps 1 through 3 apply to reassembly of computer mounting bracket.

1.   If removed, align ram mount (1) on rear of computer mounting bracket (2). Apply thread-locking compound (item 4, Appendix F) to three countersunk capscrews (3) and install countersunk capscrews to secure ram mount.

2.   Deleted.

3.   Deleted.

NOTE

Steps 4 through 10 apply to reassembly of computer.

Steps 4 and 5 apply to hard drive access cover.

4.   Ensure hard drive is securely seated.

5.   Install hard drive access cover (4) to computer (5). Tighten two captive screws (6) to secure access cover.

NOTE

Steps 6 and 7 apply to TCIM access cover.

6.   Ensure TCIM card is securely seated.

7.   Install TCIM access cover (7) to computer (5). Tighten two captive screws (8) to secure access cover.

4-9. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

8.   Inspect keyboard (9) for missing silicone seal (10).

9.   If silicone seal is missing, apply siliprene adhesive (item 1.1, Appendix F) to all gaps. Ensure that unit is sealed upon completion. Remove excess adhesive before allowing to dry.

10.   Install internal batteries to computer (5). Refer to paragraph 3-5.

4-9. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

INSTALLATION
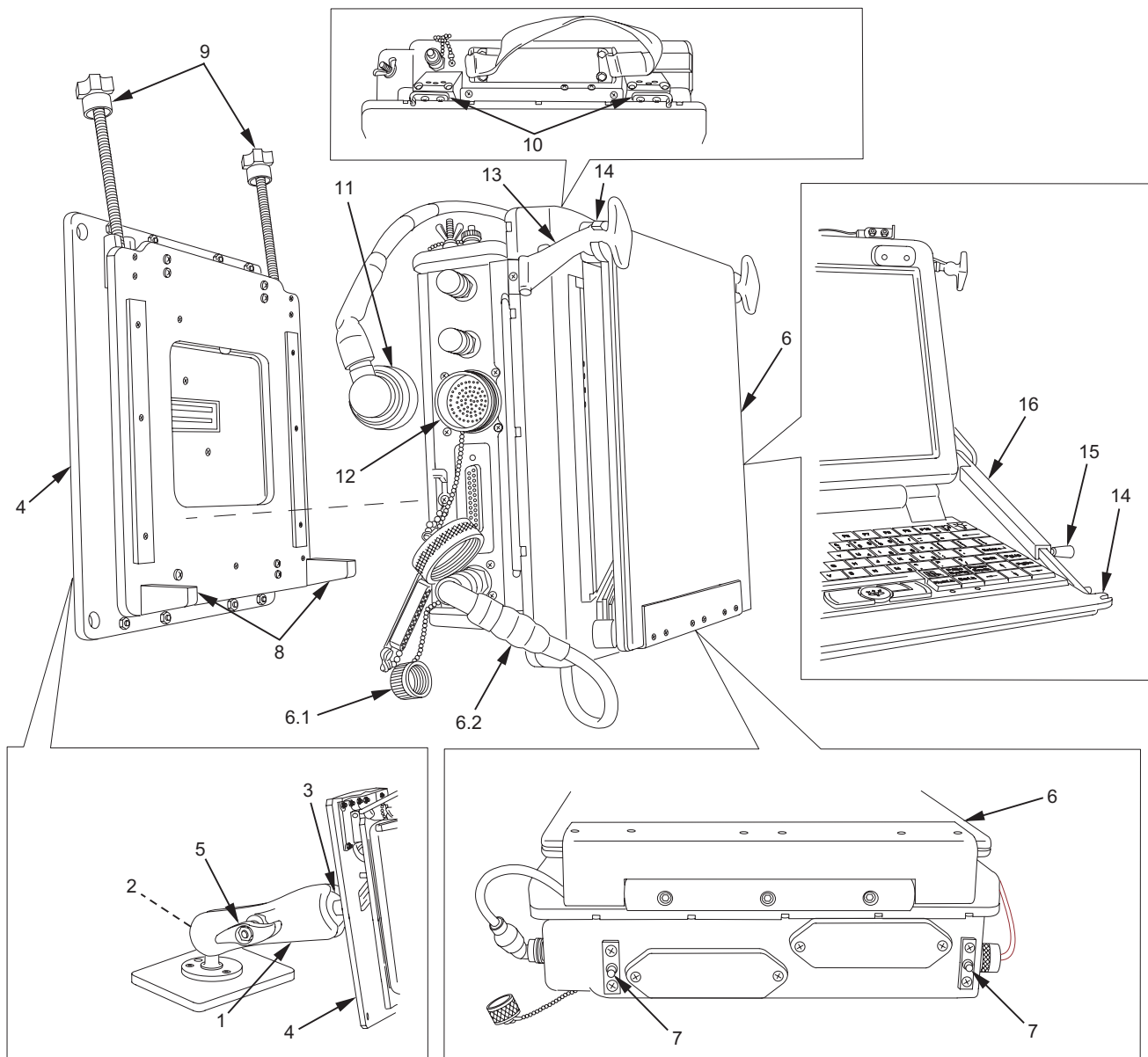
1. If removed, install ram arm (1) on ram mount (2).

2. If removed, position ram mount (3) on computer mounting bracket (4) in ram arm (1). Tighten locking knob (5).

3. Remove computer (6) from soft carrying case.

3.1. If necessary, remove dust protective cap (6.1) and connect keyboard cable (6.2).

WARNING

Ensure power is turned off at power distribution assembly before computers are installed.

CAUTION

To prevent equipment damage, do not handle computer by cable connecting keyboard to display area.

4. Align two guide pins (7) of computer (6) with holes in two guide pin receptacles (8) of computer mounting bracket (4). Install computer on computer mounting bracket.

5. Align two retainer assemblies (9) with two locking fixtures (10) on computer (6). Tighten to secure computer.

NOTE

The primary computer is connected for digital and voice messaging by the power/communication cable from PDA connector J3. The secondary computer is connected only for voice messaging by the power cable from PDA connector J1.

6. Connect cable connector (11) to J1 connector (12) on computer (6).

7. Release two rubber fasteners (13) from two U-shaped extensions (14) and pull keyboard down and away from computer display area.

8. Place spring-loaded latch (15) on arm assembly (16) to secure keyboard at desired position.

4-10. MORTAR BALLISTIC COMPUTER (MBC) CABLES.

This task covers:

a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
Cable strap (item 12, Appendix F) (as required)
Loop clamp (item 3, Appendix F) (as required)
Mounting strap (item 13, Appendix F) (as required)
Nonmetallic grommet (item 5, Appendix F) (as required)
Tie strap (item 14, Appendix F) (as required)

REMOVAL

NOTE

Refer to Appendix G for wiring diagram.

1.   Ensure that vehicle MASTER switch is OFF.

NOTE

Steps 2 through 4 apply to cable 34W2, power cable for secondary computer.
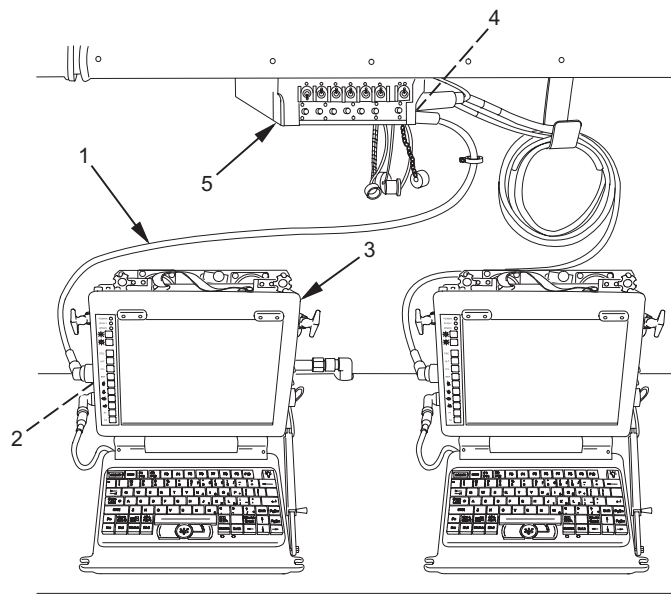
WARNING

Ensure power is turned off at power distribution assembly before disconnection of cable.

2. Disconnect cable 34W2 (1) from J1 connector (2) on secondary computer (3).

3. Remove cable strap from cable 34W2 (1).

4. Disconnect cable 34W2 (1) from J1 connector (4) on power distribution assembly (PDA) (5).

5. Remove cable 34W2 (1) from vehicle.

NOTE

Steps 6 through 9 apply to cable 4W7, power/data cable for primary computer.
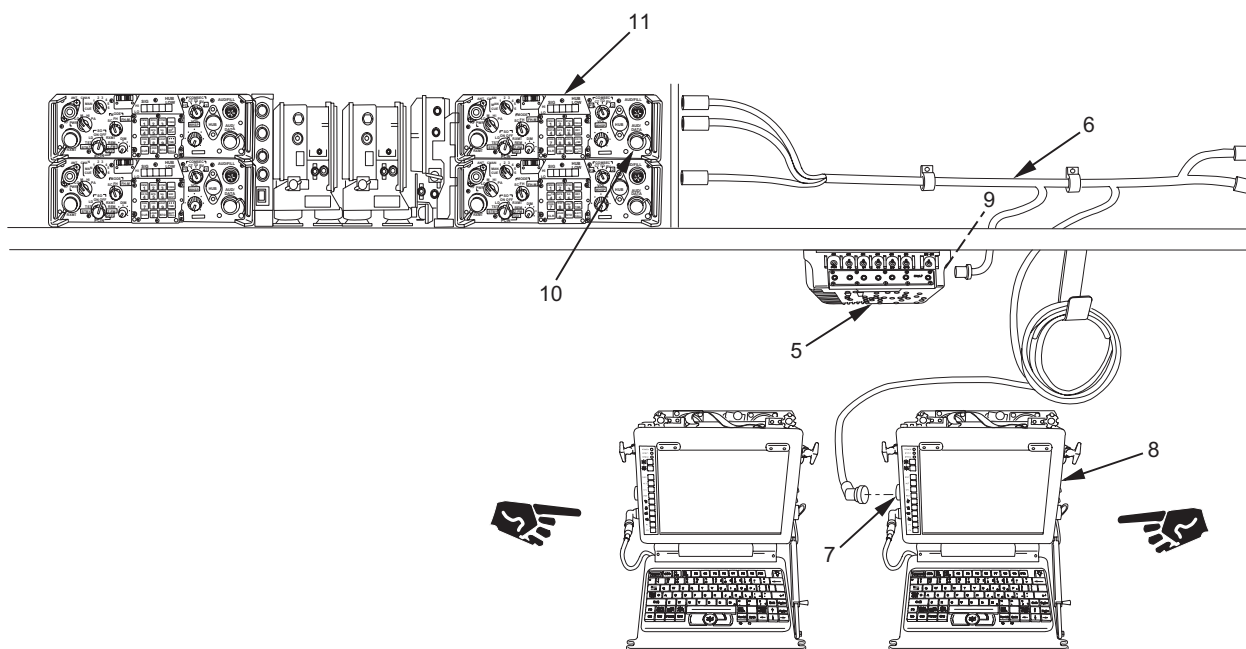
WARNING

Ensure power is turned off at power distribution assembly before disconnection of cable.

6. Disconnect cable 4W7 (6) from J1 connector (7) on primary computer (8).

7. Disconnect cable 4W7 (6) from J3 connector (9) on PDA (5).

8. Disconnect cable 4W7 (6) from AUD/DATA connector (10) on SINCGARS radio (11).

9. Remove cable straps from cable 4W7 (6) and remove cable from vehicle.

4-10. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).

NOTE

Steps 10 through 16 apply to cable 4W6, power connection cable to vehicle batteries.

| WARNING |

Ensure power is removed from system before disconnection of cable.

To avoid personnel injury when removing positive cable, avoid any contact of positive battery cable with surrounding metal surfaces. Contact can cause battery arcing or explosion. Wear safety glasses.
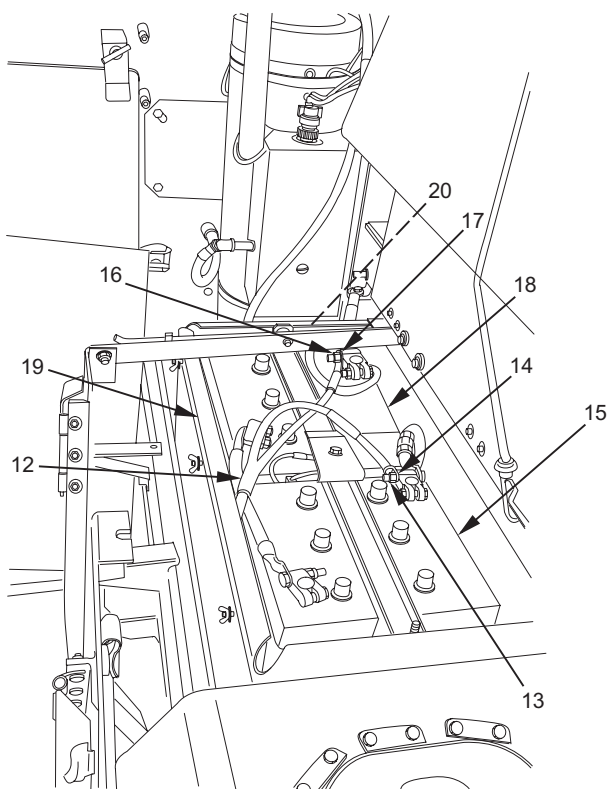
10. Remove battery terminals from battery posts before removal of cable 4W6 (12).

11. Remove nut (13) and terminal lug (14) of cable 4W6 (12) from negative terminal of battery (15).

12. Remove nut (16) and terminal lug (17) of cable 4W6 (12) from positive terminal of battery (18).

13. Install battery terminals on battery posts.

14. Carefully pull cable 4W6 (12) through hole in side of battery box (19). Remove rubber grommet (20).

15. Follow route of cable 4W6 (12) behind personnel heater and along bulkhead of vehicle. Remove cable straps from cable.
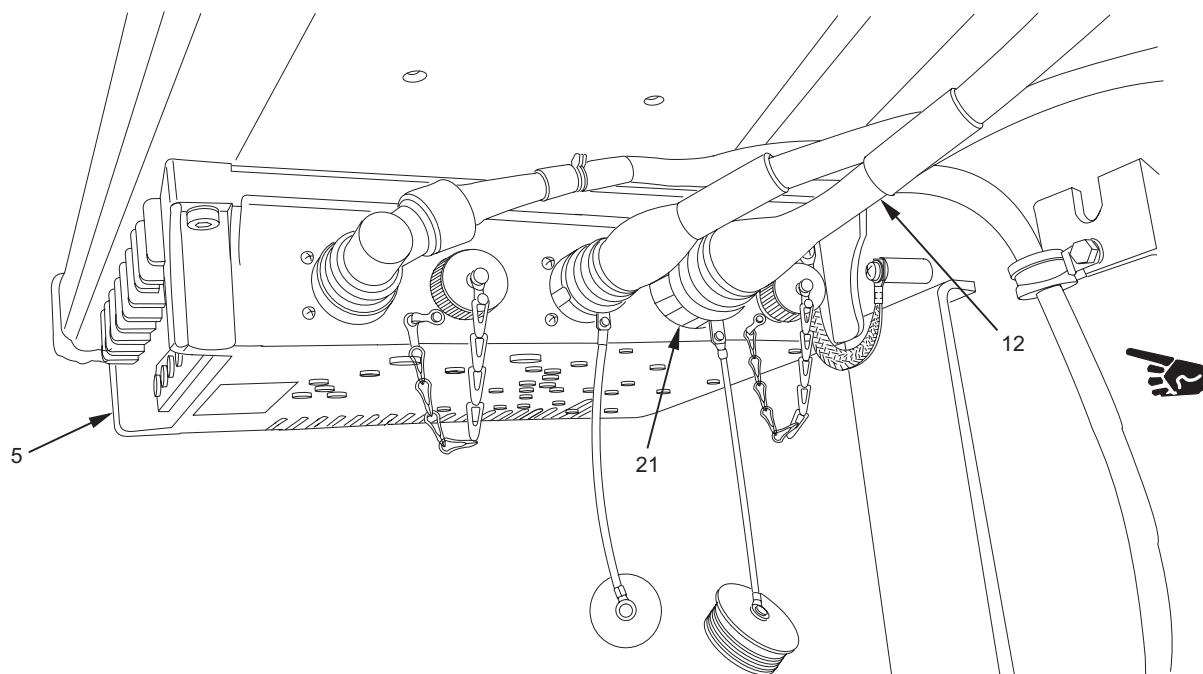
16.   Disconnect cable 4W6 (12) from J4 connector (21) on PDA (5). Remove cable from vehicle.

4-10. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).

NOTE

Steps 17 and 18 apply to cable 34W4, cable for VAC power usage.
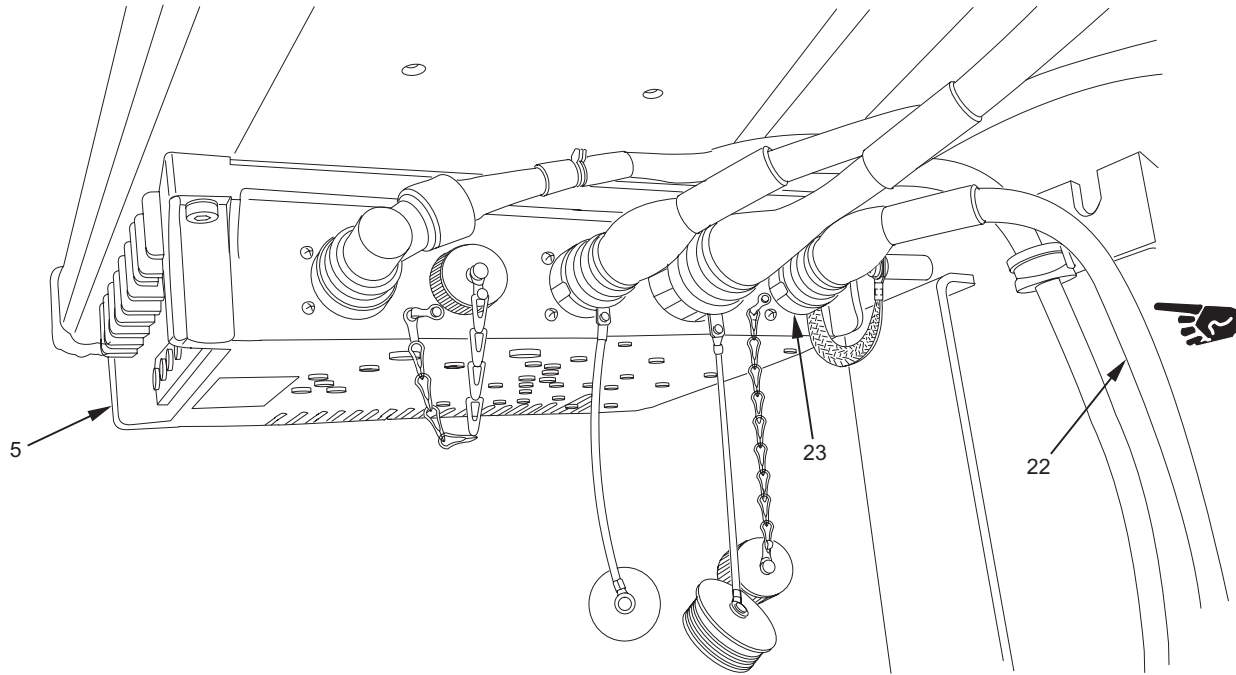
WARNING

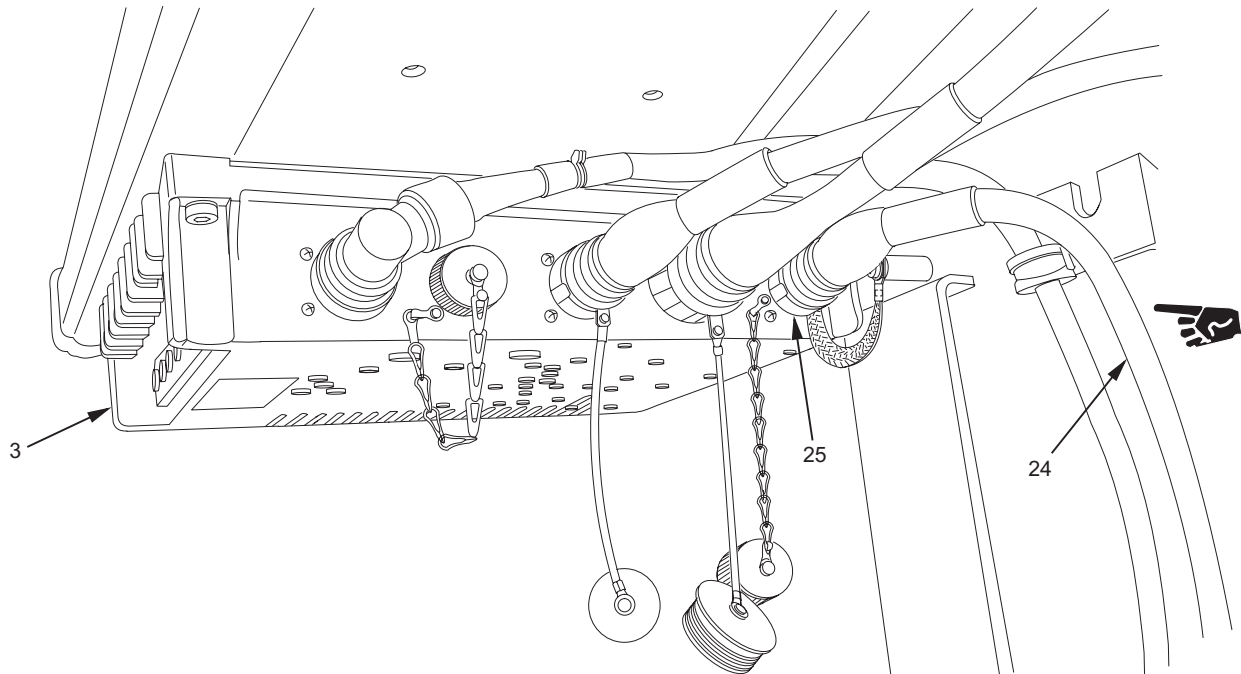Ensure power is turned off at power distribution assembly before disconnection of cable.

17. Disconnect cable 34W4 (22) from 120 VAC power source.

18. Disconnect cable 34W4 (22) from J5 connector (23) on PDA (5). Remove cable from vehicle.

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

NOTE

Refer to Appendix G for wiring diagram.

1. Ensure that vehicle MASTER switch is OFF.

NOTE

Steps 2 through 11 apply to cable 4W6, power connection cable to vehicle batteries.
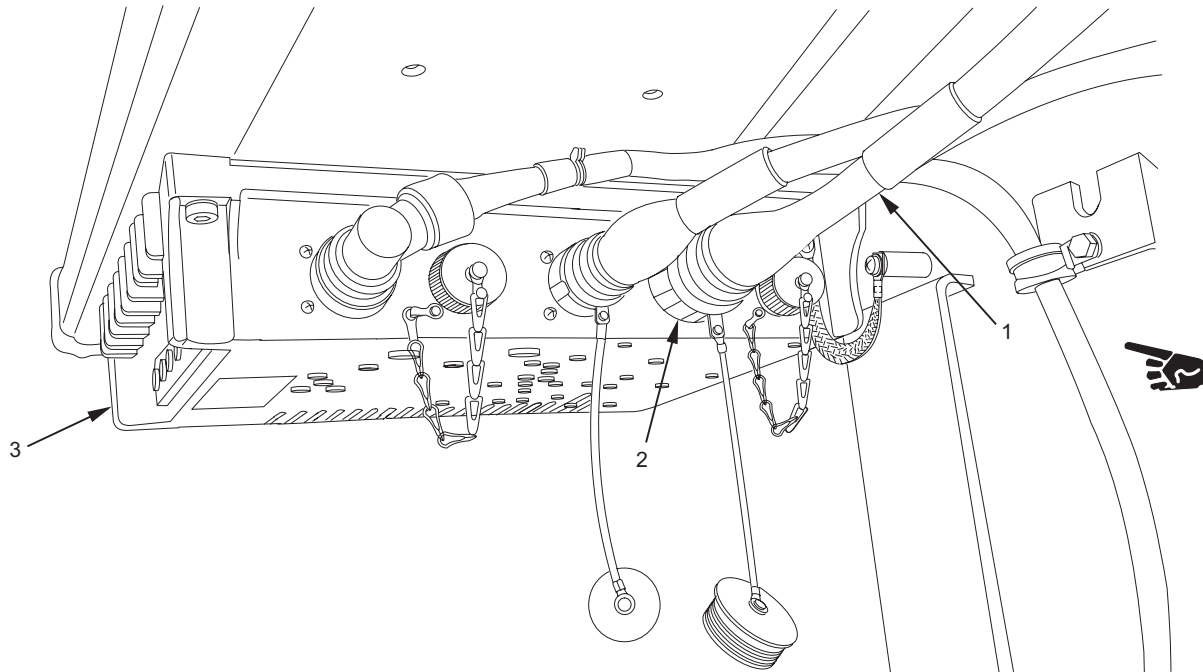
2. Position P1 connector of cable 4W6 (1) near J4 connector (2) on PDA (3).
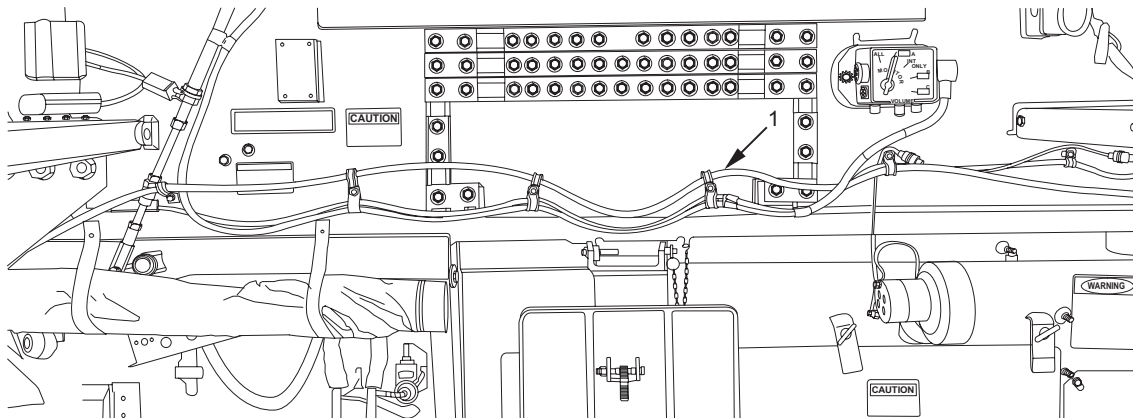
3. Position cable 4W6 (1) by following route of existing cables along outside wall and bulkhead of vehicle.

4. Secure cable 4W6 (1) with appropriate length of cable fastener (item 3, 12, 13, or 14, Appendix F). Use existing hardware and standoffs, as available.

4-10. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).
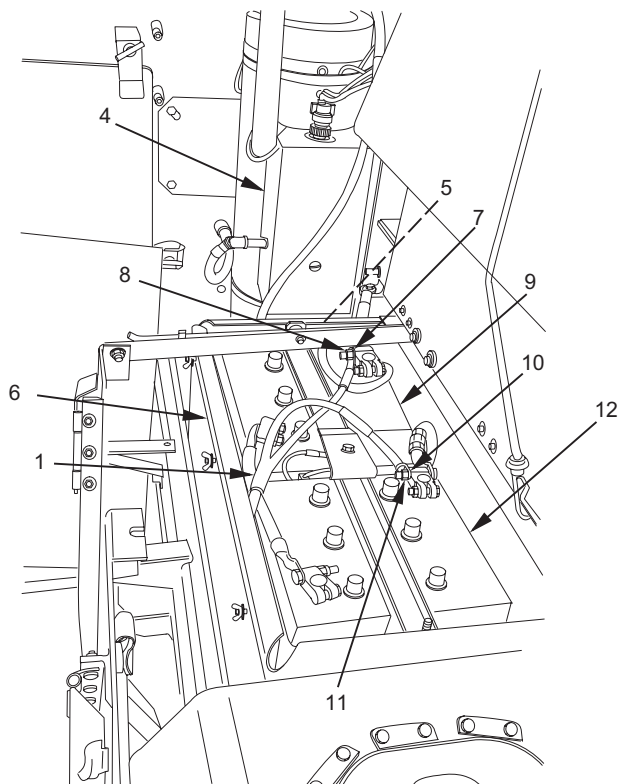
5. Route cable 4W6 (1) behind personnel heater (4). Install rubber grommet (5) (item 5, Appendix F) in rear hole in side of battery box (6). Pass cable 4W6 through rubber grommet.

WARNING

Ensure power is turned off at power distribution assembly before battery connections are made.

To avoid personnel injury when installing positive cable, avoid any contact of positive battery cable with surrounding metal surfaces. Contact can cause battery arcing or explosion. Wear safety glasses.

6. Remove battery terminals from battery posts before installation of cable 4W6 (1).

7. Install terminal lug (7) of cable 4W6 (1) and nut (8) on positive terminal of battery (9).

8. Install terminal lug (10) of cable 4W6 (1) and nut (11) on negative terminal of battery (12).

9. Install battery terminals on battery posts.

10. Stow extra length of cable 4W6 (1) in battery box (6).

11. Connect P1 connector of cable 4W6 (1) to J4 connector (2) on PDA (3).

NOTE

Steps 12 through 20 apply to cable 4W7, power/data cable for primary computer.
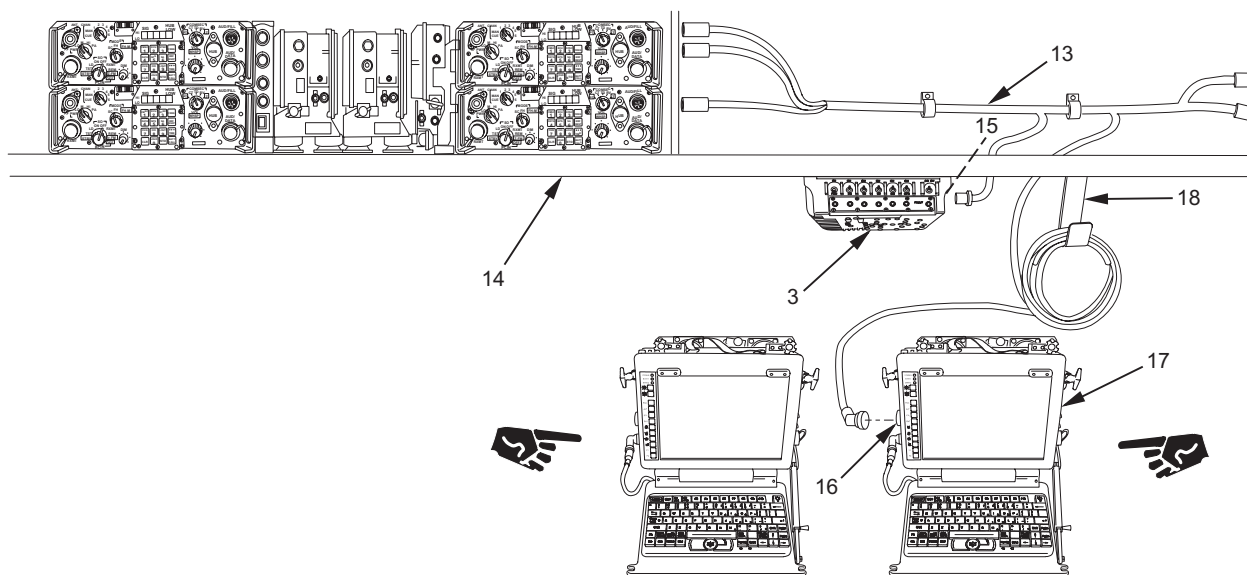
12. Locate P2 connector of cable 4W7 (13). Orient cable to right of PDA (3) on forward driver's side shelf (14).

13. Route P2 and P6 connectors of cable 4W7 (13) between forward driver's side shelf (14) and wall.

WARNING

Ensure power is turned off at power distribution assembly before connection of cable.

14. Connect P2 connector of cable 4W7 (13) to J3 connector (15) on PDA (3).

15. Bundle and store PLGR connectors (P3 and P4).

16. Connect P6 connector of cable 4W7 (13) to J1 connector (16) on primary computer (17).

NOTE

Refer to Appendix H for radio setup procedures.

Refer to TM 11-5820-890-10-7 for information about the SINCGARS radio.

17. Position P8 connector of cable 4W7 (13) for radio connection.

18. Bundle and stow P9 and P10 connectors.

19. Secure cable 4W7 (13) to existing vehicle wiring. When necessary, install longer cable fastener (item 3, 12, 13, or 14, Appendix F) to secure cable.

20. Coil P6 branch of cable 4W7 (13) and stow on cable bracket (18).

4-10. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).

NOTE

Steps 21 through 23 apply to cable 34W2, power cable for secondary computer.
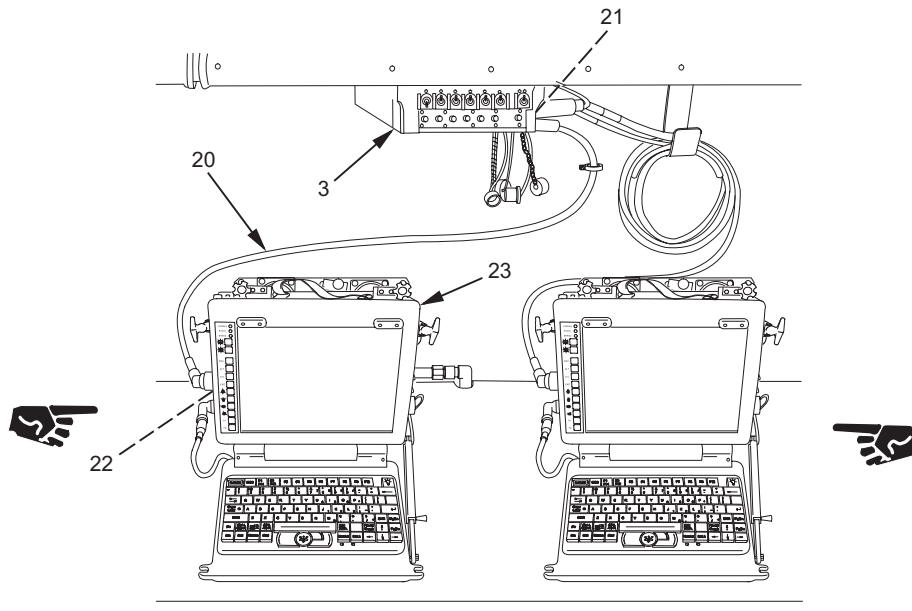
WARNING

Ensure power is turned off at power distribution assembly before connection of cable.

CAUTION

If J1 port on power distribution assembly (PDA) fails, cable 34W2 can be connected to J2 port on PDA to receive power for computer. When J2 port is used, batteries must be removed from computer to avoid equipment damage.

21. Connect cable 34W2 (20) to J1 connector (21) on PDA (3).

22. Using cable fastener (item 3, 12, 13, or 14, Appendix F) and existing hardware, secure cable 34W2 (20) to available standoff on wall near PDA (3).

23. Connect cable 34W2 (20) to J1 connector (22) on secondary computer (23).

NOTE

Steps 24 and 25 apply to cable 34W4, cable for VAC power usage.

WARNING

Ensure power is turned off at power distribution assembly before connection of cable.

24. Connect P2 connector of cable 34W4 (24) to J5 connector (25) of PDA (3) and stow cable.

25. Connect cable 34W4 (24) to 120 VAC power source when AC use is desired.

Section V. MAINTENANCE PROCEDURES FOR M1064 CARRIER

4-11. GENERAL MAINTENANCE OF HELICOIL INSERTS.

This task covers:

    a. Inspection of Installed Items   **b.** Removal   **c.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04

INSPECTION OF INSTALLED ITEMS

Inspect helicoil insert for improper installation, for breaks, and for other damage. Remove and replace as necessary.

REMOVAL
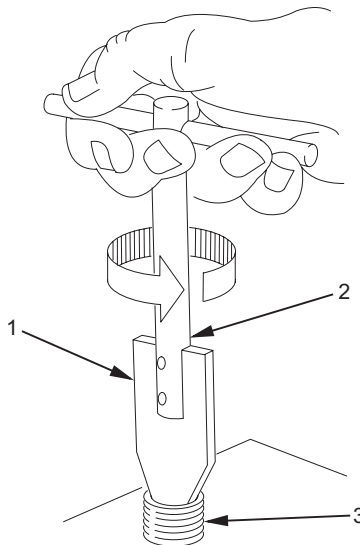
1.   Position the blade (1) of the extracting tool (2) into the center of the helicoil insert (3).

2.   Tap the top of the extracting tool (2) with a hammer to seat the tool into the helicoil insert (3).

3.   Push down on the extracting tool (2) and turn counterclockwise to back the helicoil insert (3) from the hole.

NOTE

Never reuse an insert.

4.   Discard the helicoil insert (3).

INSTALLATION
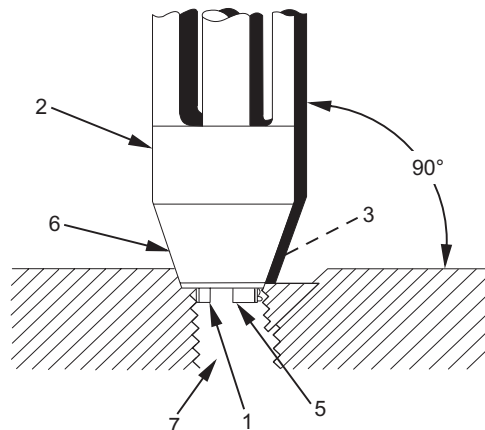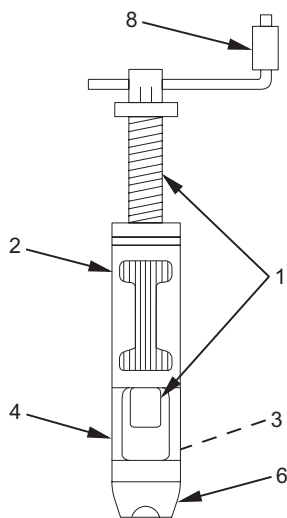
1. Retract the mandrel (1) of the helicoil inserting tool (2) and place a helicoil insert (3) into the chamber (4) with the insert tang (5) toward the chuck (6).

2. Advance the mandrel (1) until it fully engages the insert tang (5). Continue turning the mandrel, advancing the helicoil insert (3) into the chuck (6) until the mandrel and insert are flush with the tip of the chuck.

3. Hold the helicoil inserting tool (2) firmly and squarely against the work with the helicoil insert (3) aligned with the tapped hole (7).

4. Rotate the handle (8) clockwise at a slow uniform rate until the top coil of the helicoil insert (3) is 1/4 to 1/2 turn below the top work surface of the tapped hole (7).

5. Rotate the handle (8) counterclockwise to remove mandrel (1) from the tapped hole (7).

6. Place the punch end (9) of the tang break-off tool (10) into the center of the helicoil insert (3), resting the tool squarely on the insert tang (5).

7. Strike the top of the tang break-off tool (10) with a sharp blow (using a soft-faced hammer) to break insert tang (5) from installed helicoil insert (3).

8. If needed, use long narrow tweezers to remove the insert tang (5) from insert hole.
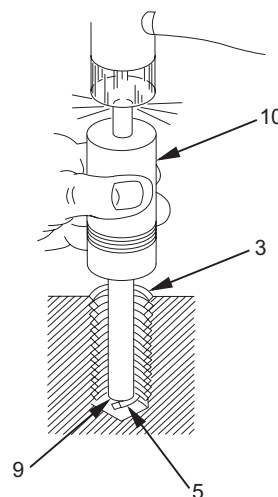
4-12. POWER DISTRIBUTION ASSEMBLY.

This task covers:

    a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
    Lock washer (4) MS35338-140
    Thread-locking compound (item 4, Appendix F)
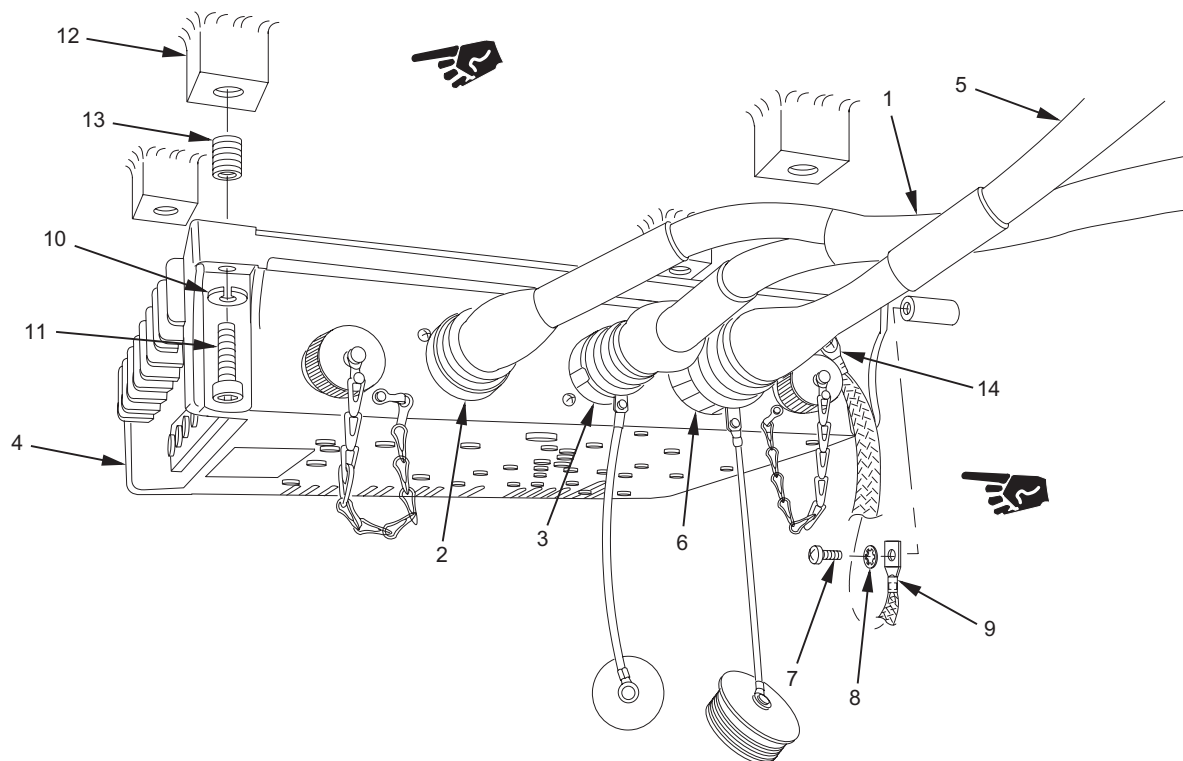
REMOVAL

$$\boxed{\textbf{WARNING}}$$

    Ensure power is removed from system before power distribution assembly is removed.

1.   Disconnect power/data cable 3W17 (1) from J2 and J3 connectors (2 and 3) on power distribution assembly (PDA) (4).

2.   Disconnect power cable 3W6 (5) from J4 connector (6) on PDA (4).

2.1. Remove machine screw (7), internal-tooth washer (8), and ground strap (9) from vehicle standoff.

2.2. Remove ground strap (9) from PDA (4).

3. Remove four lock washers (10), four socket head capscrews (11), and PDA (4) from four welded standoffs (12). Discard lock washers.

4. If damaged, remove and discard four helicoil inserts (13).

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

1. Deleted.

2. Deleted.

3. Deleted.

4. Deleted.

5. Deleted.

```
WARNING
```

Ensure power is removed from system before power distribution assembly is installed.

5.1. If removed, install four new helicoil inserts (13).

6. Position PDA (4) under four welded standoffs (12) and align holes. Apply thread-locking compound (item 4, Appendix F) to four socket head capscrews (11) and install four new lock washers (10) and capscrews. Torque capscrews to 32 ft-lb (43.4 N-m).

6.1. Using thumbscrew (14), install ground strap (9) to PDA (4).

6.2. Install other end of ground strap (9) to vehicle standoff, using internal-tooth washer (8) and machine screw (7).

7. Connect power cable 3W6 (5) to J4 connector (6) on PDA (4).

8. Connect power/data cable 3W17 (1) to J2 and J3 connectors (2 and 3) on PDA (4).

4-13. COMPUTER AND COMPUTER MOUNTING BRACKET.

This task covers:

a. Removal   **b.** Disassembly   **c.** Inspection/Repair   **d.** Reassembly   **e.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
    Siliprene adhesive (item 1.1, Appendix F)
    Soft carrying case (item 3, Appendix D (Basic Issue Items))
    Thread-locking compound (item 4, Appendix F)

REMOVAL
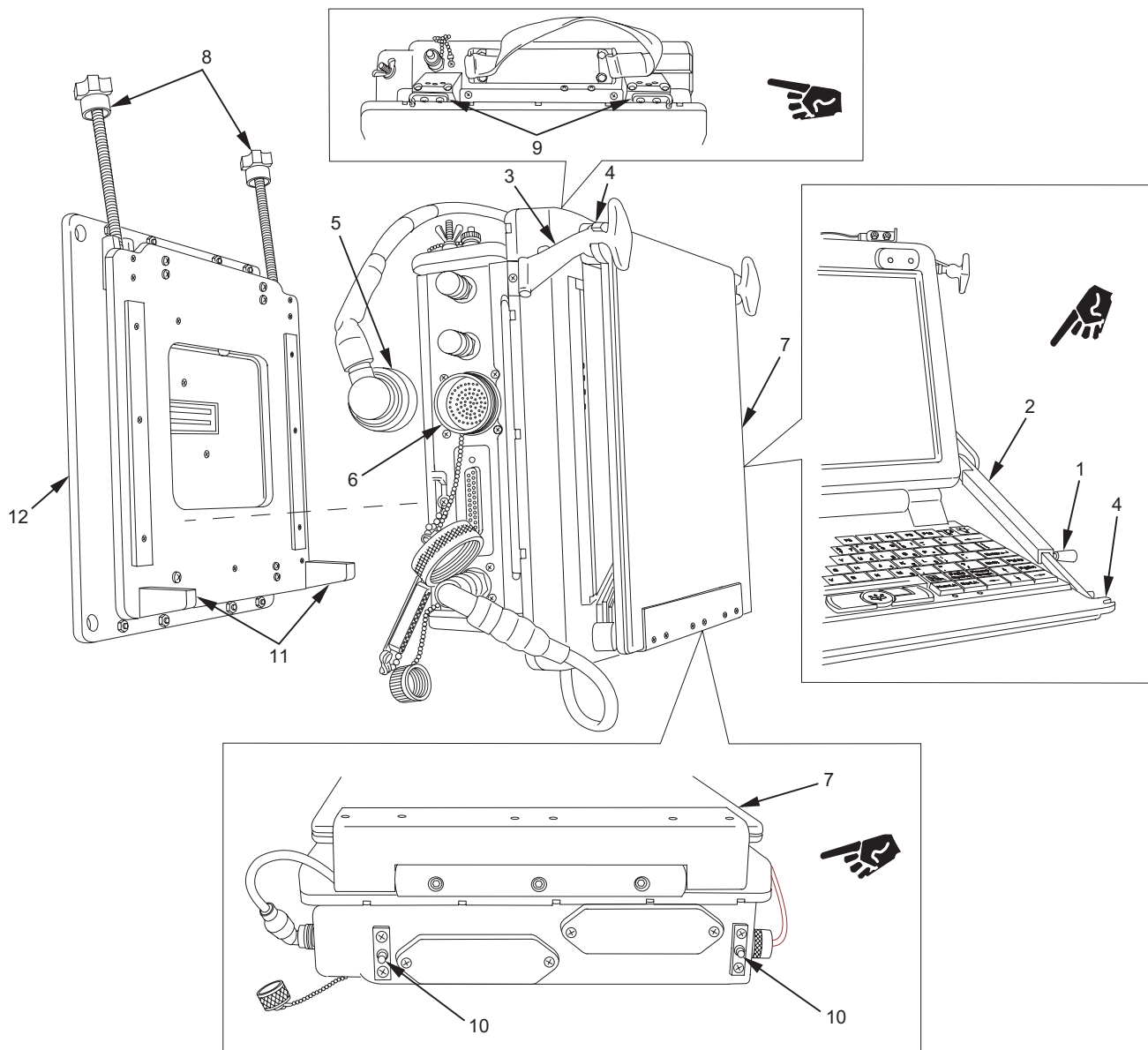
1. Release spring-loaded latch (1) on arm assembly (2) and fold keyboard against display area. Pull two rubber fasteners (3) into two U-shaped extensions (4) to secure keyboard.

WARNING

Ensure power is turned off at power distribution assembly before computer is removed.

CAUTION

To prevent equipment damage, do not handle computer by cable connecting keyboard to display area.

2. Disconnect cable connector (5) from J1 connector (6) on computer (7).

3. Loosen knobs on two retainer assemblies (8) and release from two locking fixtures (9).

4. Lift computer (7) and remove two guide pins (10) from two guide pin receptacles (11) of computer mounting bracket (12).

CAUTION

To avoid damage to keyboard cable connector, disconnect cable and install dust protective cap prior to placement of computer into carrying case.

5. Place computer (7) in soft carrying case (item 3, Appendix D) and store per unit SOP.
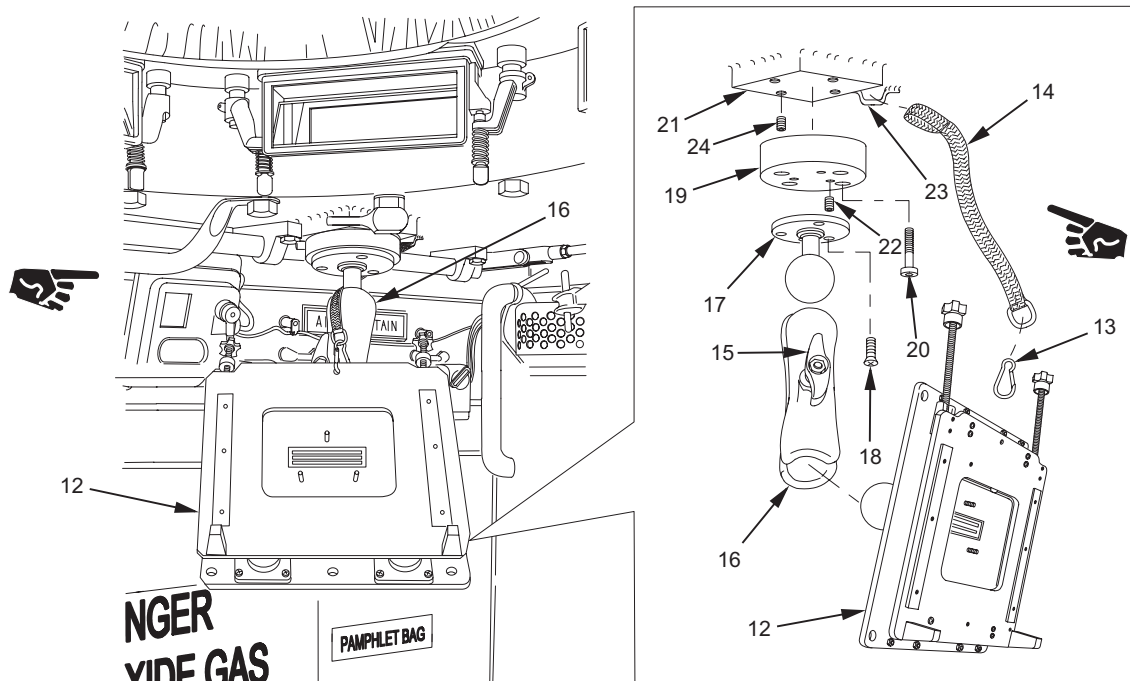
6. Open spring snap (13) on safety lanyard (14) and remove from center hole of computer mounting bracket (12).

7. Loosen locking knob (15) on ram arm (16) and remove computer mounting bracket (12).

8. If damaged, remove ram arm (16) from ram mount (17).

4-13. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

REMOVAL (cont)

9.   If damaged, remove three countersunk capscrews (18) and ram mount (17) from bottom mounting block (19).

10. If damaged, remove four socket head capscrews (20) and bottom mounting block (19) from top mounting block (21).

11. If damaged, remove three helicoil inserts (22) from bottom mounting block (19). Discard helicoil inserts.

12. If damaged, remove safety lanyard (14) from D-ring (23). Inspect spring snap (13) and remove from safety lanyard, if damaged.

13. If damaged, remove four helicoil inserts (24) from top mounting block (21). Discard helicoil inserts.

DISASSEMBLY

NOTE
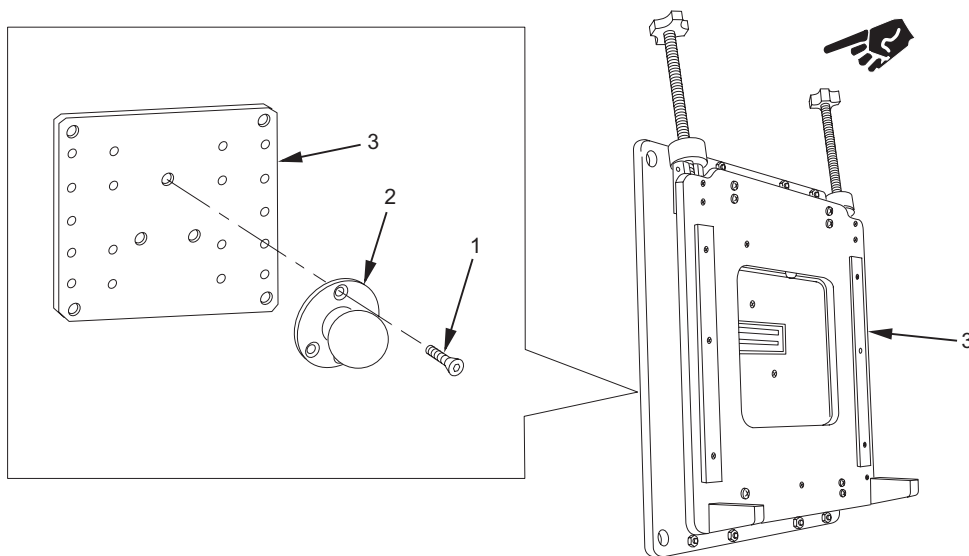
Steps 1 through 3 apply to disassembly of computer mounting bracket.

1.   Deleted.

2.   Deleted.

3.   If damaged, remove three countersunk capscrews (1) and ram mount (2) from rear of computer mounting bracket (3).

NOTE

Steps 4 through 8 apply to disassembly of computer.

4.   Remove internal batteries from computer (4). Refer to paragraph 3-5.

NOTE

Steps 5 and 6 apply to TCIM access cover.

5.   Loosen two captive screws (5) and remove TCIM access cover (6) from computer (4).

6.   Inspect bumper (7) for serviceability. If damaged, replace TCIM access cover (6).

NOTE

Steps 7 and 8 apply to hard drive access cover.

7.   Loosen two captive screws (8) and remove hard drive access cover (9) from computer (4).

4-13. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

8. Inspect bumper (10) for serviceability. If damaged, replace hard drive access cover (9).

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

REASSEMBLY

NOTE

Steps 1 through 3 apply to reassembly of computer mounting bracket.

1. If removed, align ram mount (1) on rear of computer mounting bracket (2). Apply thread-locking compound (item 4, Appendix F) to three countersunk capscrews (3) and install countersunk capscrews to secure ram mount.

2. Deleted.

3. Deleted.

NOTE

Steps 4 through 10 apply to reassembly of computer.

Steps 4 and 5 apply to hard drive access cover.

4. Ensure hard drive is securely seated.

5. Install hard drive access cover (4) to computer (5). Tighten two captive screws (6) to secure access cover.
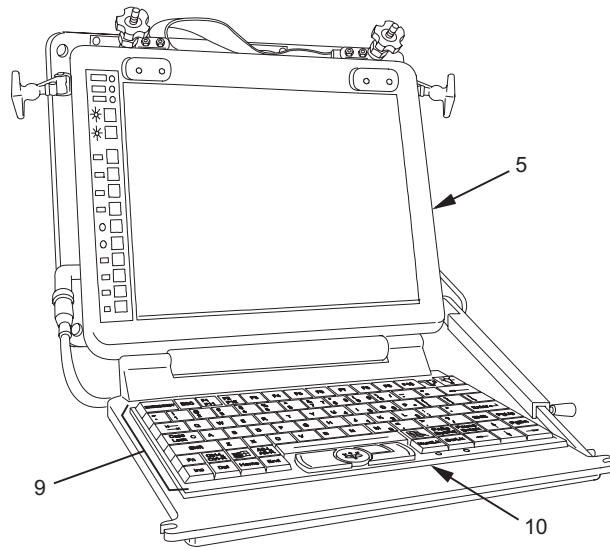
NOTE

Steps 6 and 7 apply to TCIM access cover.

6. Ensure TCIM card is securely seated.

7. Install TCIM access cover (7) to computer (5). Tighten two captive screws (8) to secure access cover.

**4-13. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).**

8. Inspect keyboard (9) for missing silicone seal (10).

9. If silicone seal is missing, apply siliprene adhesive (item 1.1, Appendix F) to all gaps. Ensure that unit is sealed upon completion. Remove excess adhesive before allowing to dry.

10. Install internal batteries to computer (5). Refer to paragraph 3-5.

4-13. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

INSTALLATION
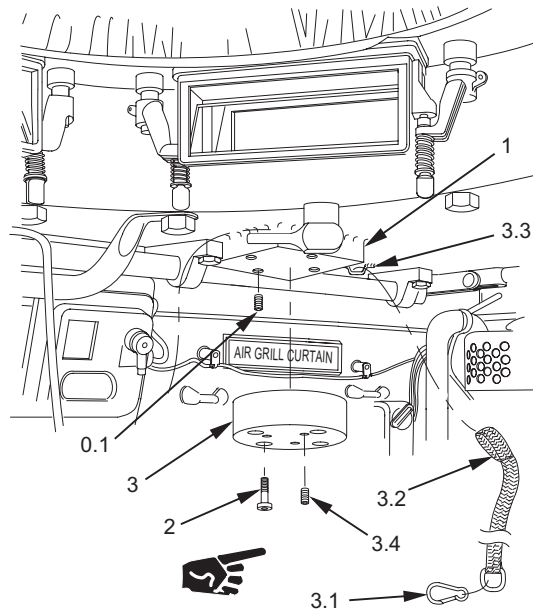
1.   Deleted.

2.   Deleted.

3.   Deleted.

4.   Deleted.

4.1. If removed, install four new helicoil inserts (0.1) to top mounting block (1).

5.   Apply thread-locking compound (item 4, Appendix F) to four socket head capscrews (2). Install bottom mounting block (3) and four socket head capscrews to top mounting block (1).

5.1. If removed, install new spring snap (3.1) to safety lanyard (3.2).

5.2. If removed, install safety lanyard (3.2) to D-ring (3.3).

5.3. If removed, install three new helicoil inserts (3.4) to bottom mounting block (3).
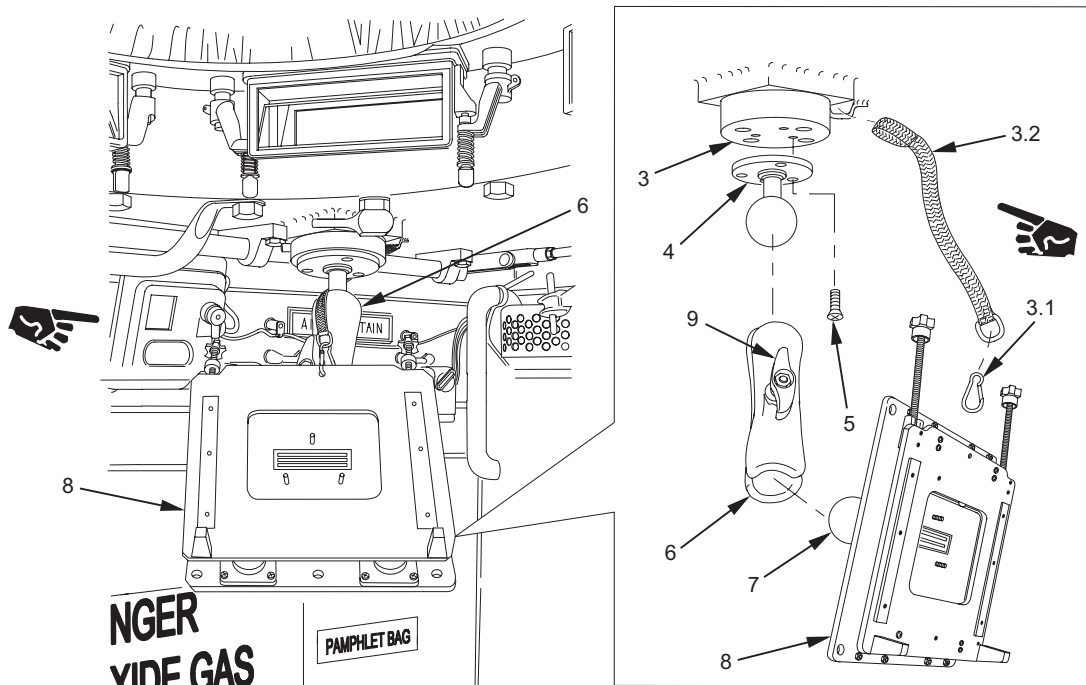
6. If ram mount (4) is removed, apply thread-locking compound (item 4, Appendix F) to three countersunk capscrews (5). Install ram mount and three countersunk capscrews on bottom mounting block (3).

7. If removed, install ram arm (6) on ram mount (4).

8. Position ram mount (7) on rear of computer mounting bracket (8) in ram arm (6). Tighten locking knob (9).

8.1. Attach spring snap (3.1) on safety lanyard (3.2) to center hole of computer mounting bracket (8).

4-13. COMPUTER AND COMPUTER MOUNTING BRACKET (cont).

INSTALLATION (cont)
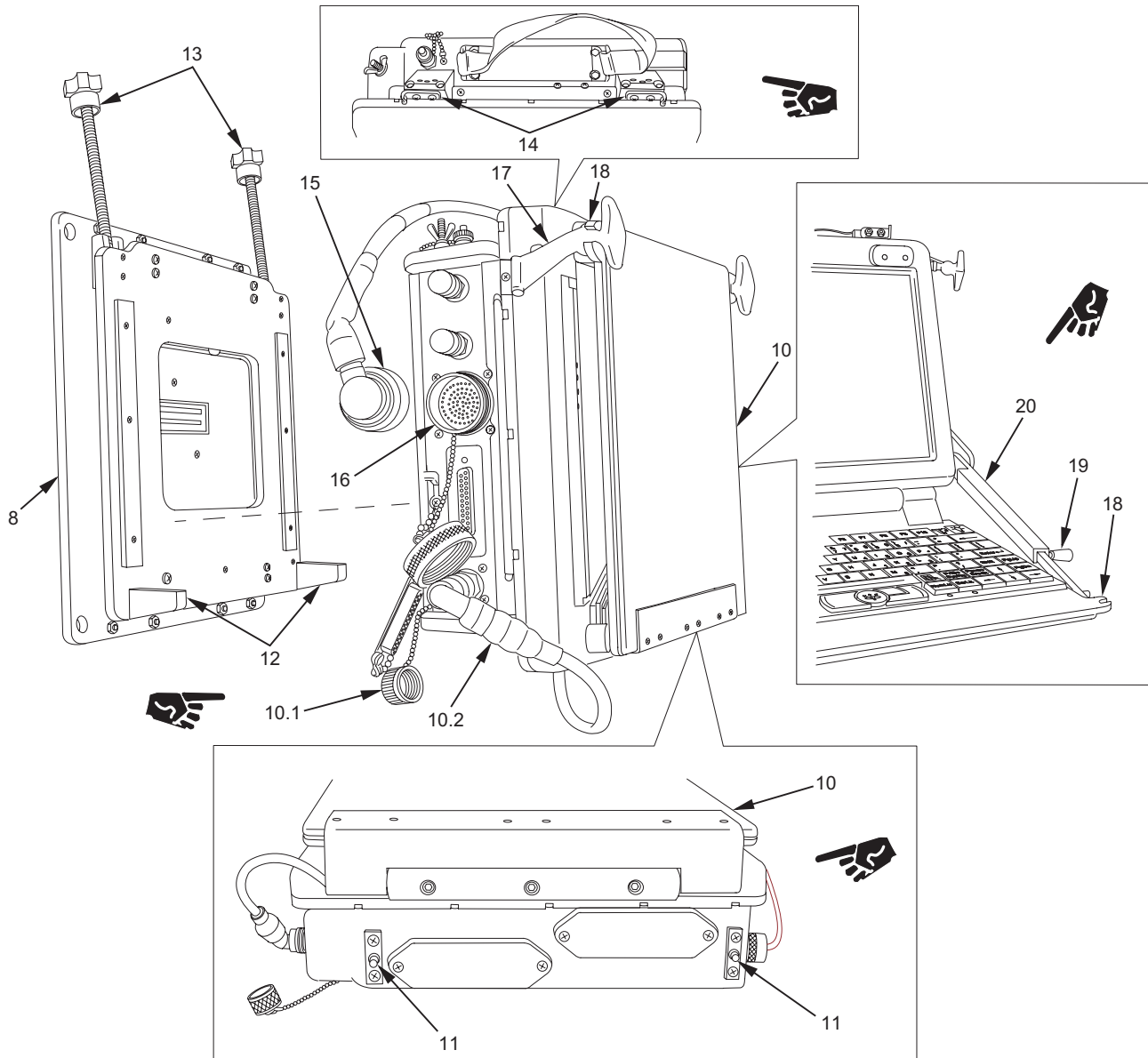
9.   Remove computer (10) from soft carrying case.

9.1. If necessary, remove dust protective cap (10.1) and connect keyboard cable (10.2).

WARNING

Ensure power is turned off at power distribution assembly before computer is installed.

CAUTION

To prevent equipment damage, do not handle computer by cable connecting keyboard to display area.

10. Align two guide pins (11) of computer (10) with holes in two guide pin receptacles (12) of computer mounting bracket (8). Install computer on computer mounting bracket.

11. Align two retainer assemblies (13) with two locking fixtures (14) on computer (10). Tighten to secure computer.

12. Connect cable connector (15) to J1 connector (16) on computer (10).

13. Release two rubber fasteners (17) from two U-shaped extensions (18) and pull keyboard down and away from computer display area.

14. Place spring-loaded latch (19) on arm assembly (20) to secure keyboard at desired position.

4-14. MORTAR BALLISTIC COMPUTER (MBC) CABLES.

This task covers:

    a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04

Materials/Parts
    Cable strap (item 12, Appendix F) (as required)
    Loop clamp (item 3, Appendix F) (as required)
    Loop clamp (4) (item 3.1, Appendix F)
    Mounting strap (item 13, Appendix F) (as required)
    Nonmetallic grommet (item 5, Appendix F) (as required)
    Self-locking nut (2) M45913/1-4CS3
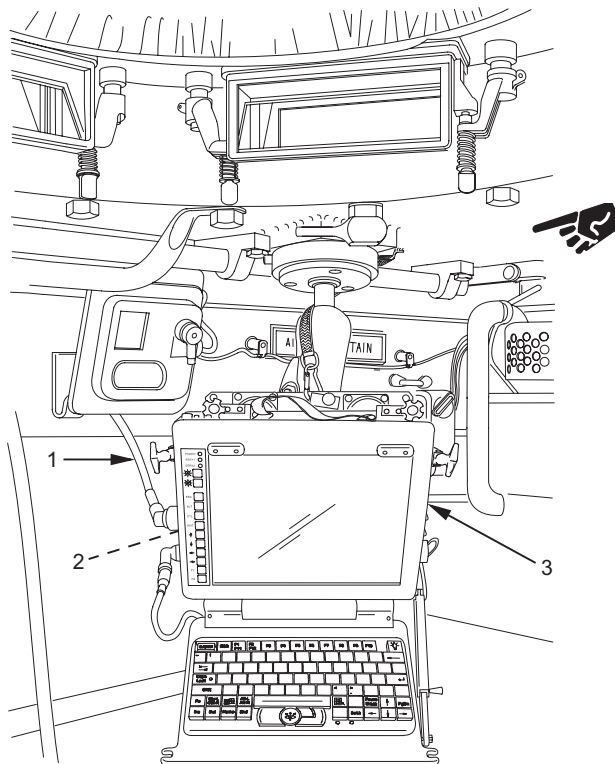   Tie strap (item 14, Appendix F) (as required)

REMOVAL

NOTE

Refer to Appendix G for wiring diagram.

1. Ensure that vehicle MASTER switch is OFF.
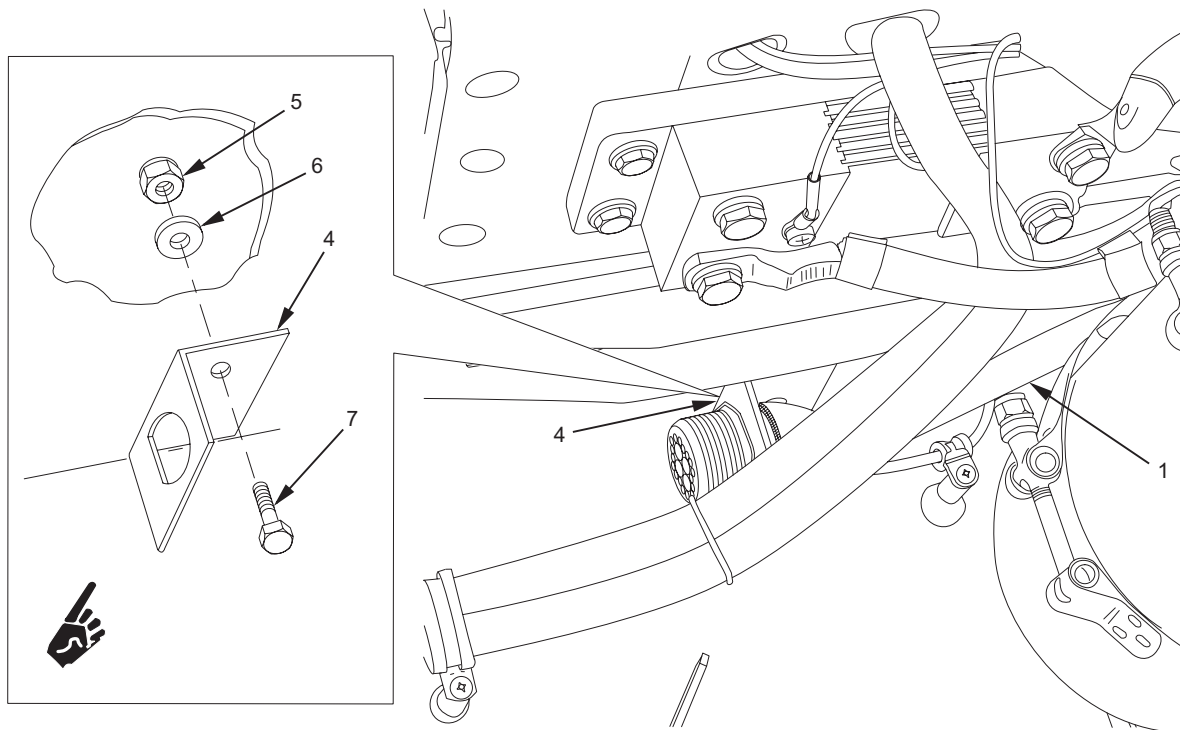
NOTE

Steps 2 through 8 apply to cable 3W17, power/data cable for computer.

WARNING

Ensure power is turned off at power distribution assembly before disconnection of cable.

2. Disconnect cable 3W17 (1) from J1 connector (2) on computer (3).

3. Remove connector of cable 3W17 (1) from cable bracket (4).

4. If damaged, remove two self-locking nuts (5), two flat washers (6), two hexagon head capscrews (7), and cable bracket (4). Discard self-locking nuts.

4-14. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).
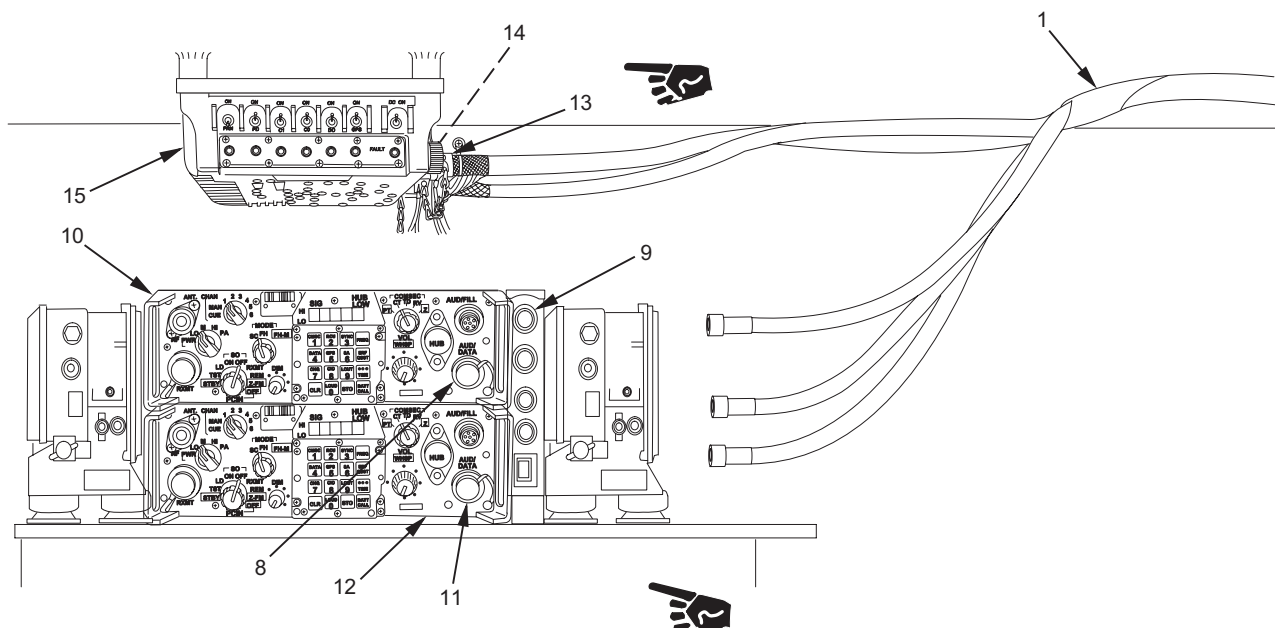
5. Disconnect two connectors of cable 3W17 (1) from AUD/DATA connector (8) and J6 connector (9) on top SINCGARS radio (10).

6. Disconnect cable 3W17 (1) from AUD/DATA connector (11) on bottom SINCGARS radio (12).

7. Remove two connectors of cable 3W17 (1) from J2 connector (13) and J3 connector (14) on power distribution assembly (PDA) (15).

8. Remove cable straps and loop clamps from cable 3W17 (1), carefully remove other connectors from stowage behind instrument panel, and remove cable from vehicle.

NOTE

Steps 9 through 15 apply to cable 3W6, power connection cable to vehicle batteries.

WARNING

Ensure power is removed from system before disconnection of cable.

To avoid personnel injury when removing positive cable, avoid any contact of positive battery cable with surrounding metal surfaces. Contact can cause battery arcing or explosion. Wear safety glasses.

9. Remove battery terminals from battery posts before removal of cable 3W6.
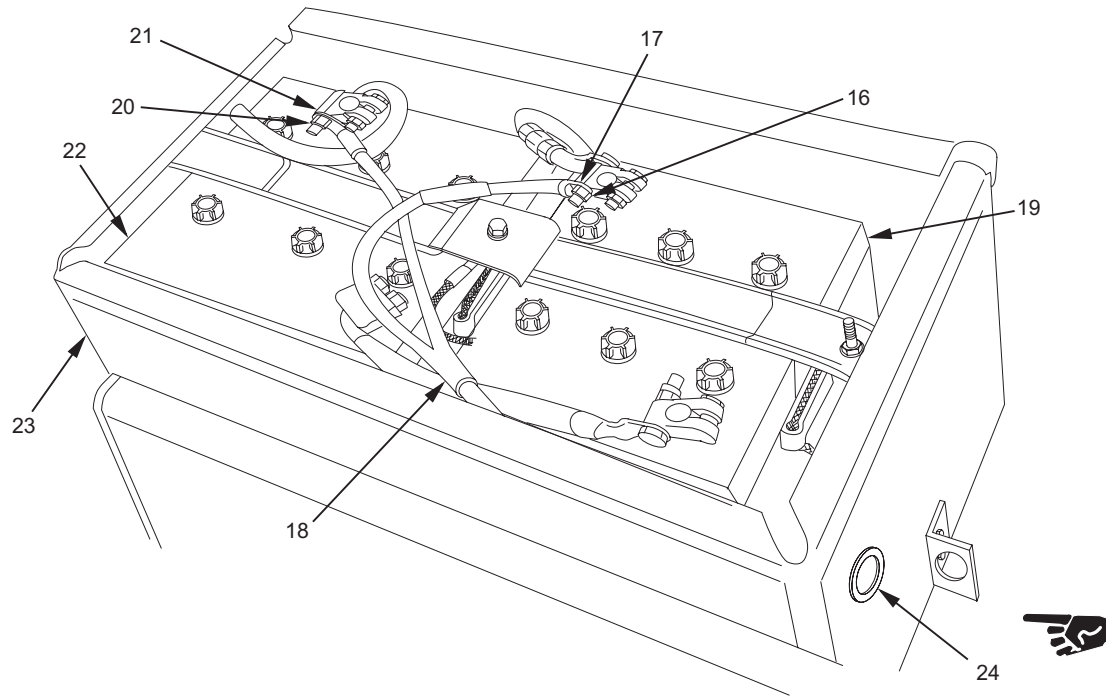
10. Remove nut (16) and terminal lug (17) of cable 3W6 (18) from negative terminal of battery (19).

11. Remove nut (20) and terminal lug (21) of cable 3W6 (18) from positive terminal of battery (22).

12. Install battery terminals on battery posts.

13. Carefully pull cable 3W6 (18) through hole in side of battery box (23). Remove rubber grommet (24).

14. Follow route of cable 3W6 (18) along radio rack. Remove cable straps from cable.

4-14. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).
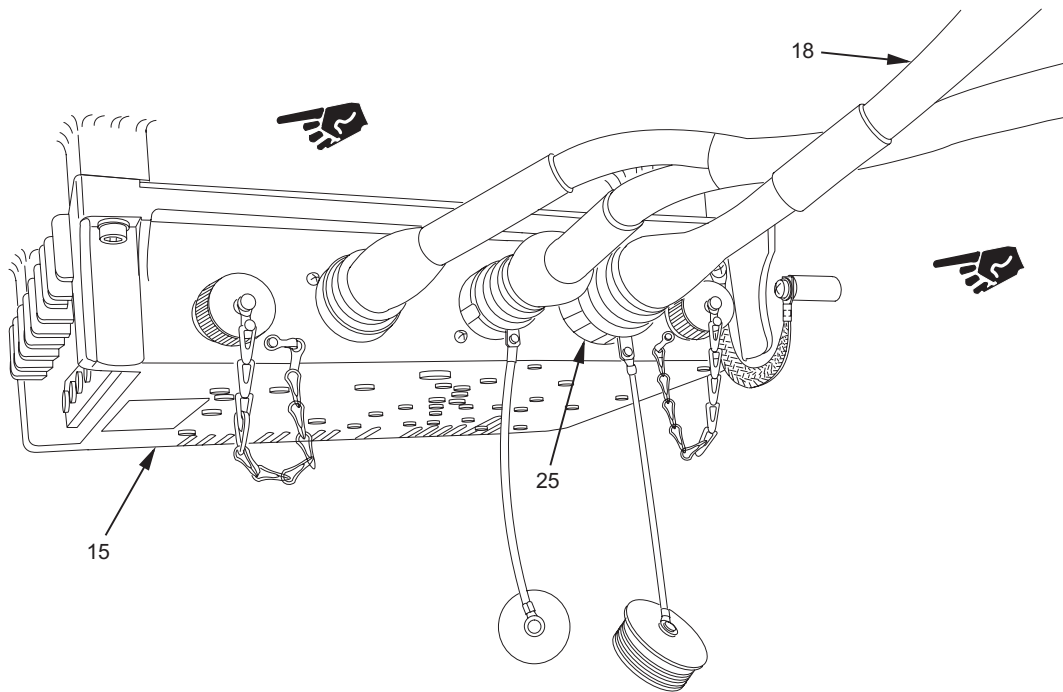
15. Disconnect cable 3W6 (18) from J4 connector (25) on PDA (15). Remove cable from vehicle.

NOTE

Steps 16 and 17 apply to cable 34W4, cable for VAC power usage.
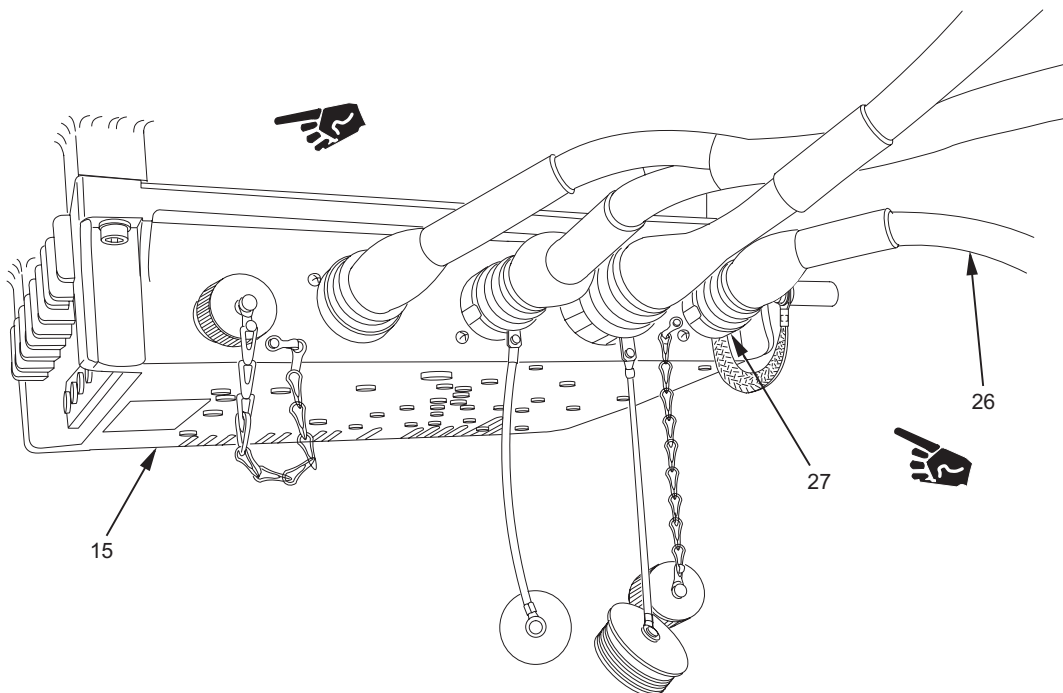
WARNING

Ensure power is turned off at power distribution assembly before disconnection of cable.

16.   Disconnect cable 34W4 (26) from 120 VAC power source.

17.   Disconnect cable 34W4 (26) from J5 connector (27) on PDA (15). Remove cable from vehicle.

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

NOTE

If mortar ballistic computer cables are being installed in vehicle for the first time, proceed with step 1. If cables are being installed in a previously-modified vehicle, proceed to step 7.

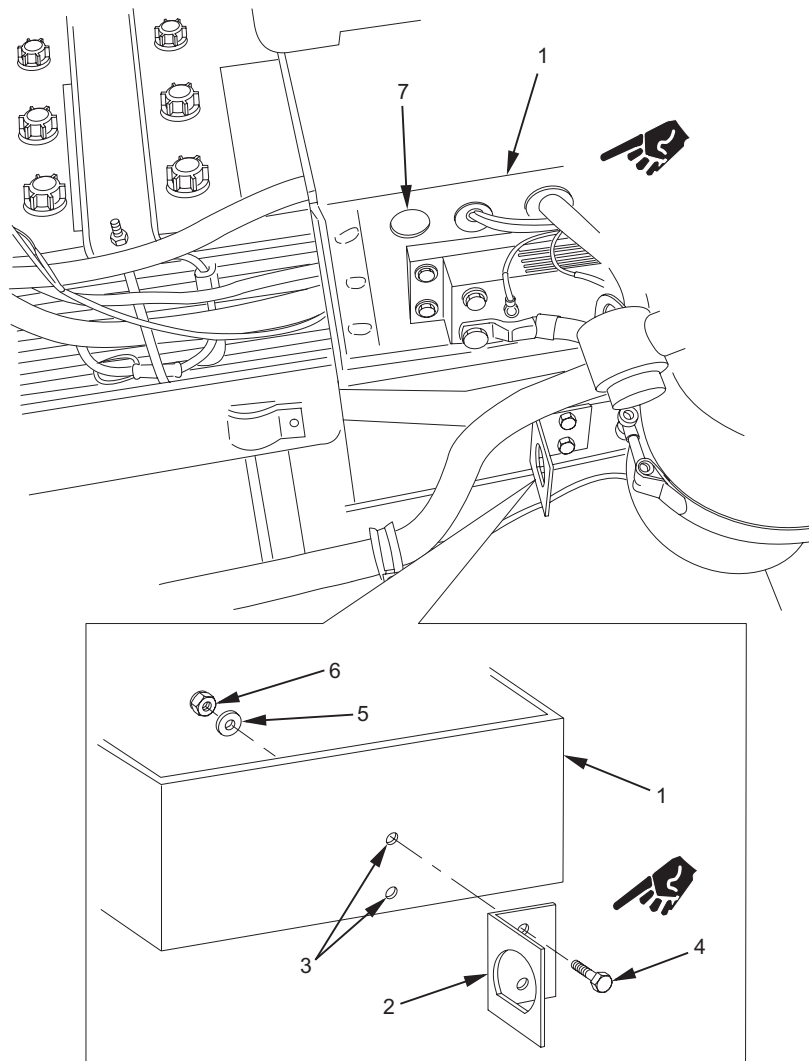**4-14. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).**

CAUTION

To avoid possible battery rupture, ensure that battery box drawer is pulled out before drilling.

1. Open door of battery box (1) and pull drawer out as far as possible.

2. Locate an area on the right side of battery box (1), behind the driver's seat. Choose a location approximately 8.0 in. (20.3 cm) from vehicle wall and approximately 1.0 in. (2.5 cm) from bottom of battery box.

3. Using cable bracket (2) as a template, mark locations for two holes on side wall of battery box (1). Remove cable bracket.

WARNING

When drilling metal, always wear safety glasses for eye protection. Use a disposable face mask when dust and/or vapors are present.

4. Using drill and 9/32 in. (0.71 cm) drill bit, drill two holes (3) in battery box (1).

5. Install cable bracket (2), two hexagon head capscrews (4), two flat washers (5), and two new self-locking nuts (6) on battery box (1).

6. Choose a location approximately 10.5 in. (26.7 cm) from vehicle wall and approximately 2.0 in. (5.1 cm) from the top of the battery box (1), behind the driver's seat. Drill 1-3/8 in. (3.49 cm) hole (7) into side of battery box.

NOTE

Steps 7 through 15 apply to cable 3W6, power connection cable to vehicle batteries.
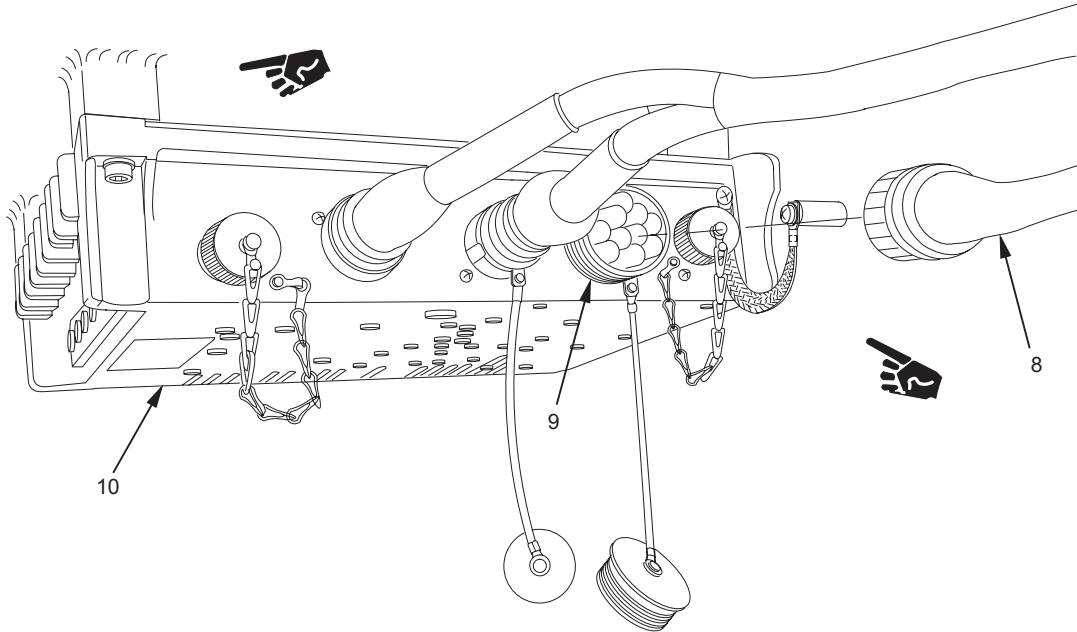
7. Position P1 connector of cable 3W6 (8) near J4 connector (9) on PDA (10).

4-14. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).

8. Route cable 3W6 (8) to vehicle wall, beside radio rack, and down to side of battery box (1). Thread cable 3W6 into rubber grommet (11) (item 5, Appendix F) and install rubber grommet into hole (7) in side of battery box.

<div align="center">

WARNING

</div>

Ensure power is turned off at power distribution assembly before battery connections are made.
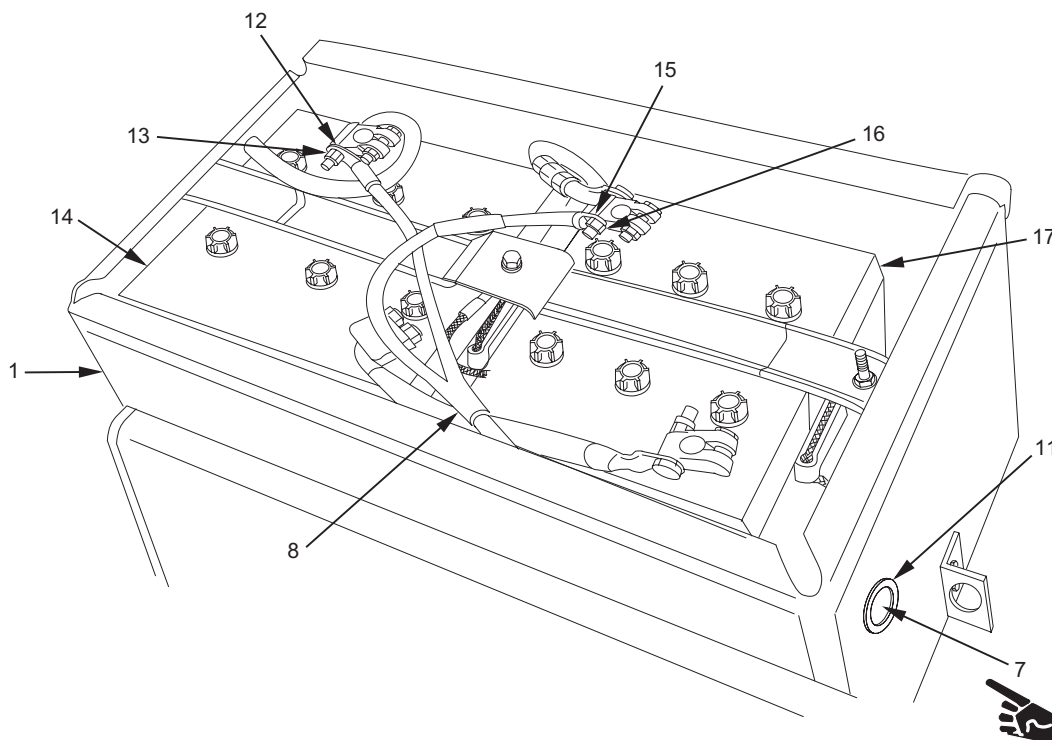
To avoid personnel injury when installing positive cable, avoid any contact of positive battery cable with surrounding metal surfaces. Contact can cause battery arcing or explosion. Wear safety glasses.

9. Remove battery terminals from battery posts before installation of cable 3W6 (8).

10. Install terminal lug (12) of cable 3W6 (8) and nut (13) on positive terminal of battery (14).

11. Install terminal lug (15) of cable 3W6 (8) and nut (16) on negative terminal of battery (17).

12. Install battery terminals on battery posts.

13. Stow extra length of cable 3W6 (8) in battery box (1).

14. Secure cable 3W6 (8) with appropriate length of cable fastener (item 3, 12, 13, or 14, Appendix F). Use existing hardware and standoffs, as available.

15. Connect P1 connector of cable 3W6 (8) to J4 connector (9) of PDA (10).

NOTE

Steps 16 through 28 apply to cable 3W17, power/data cable for computer.

16. Position cable 3W17 (18) with P1, P2, P4, P5, and P7 connectors placed on radio rack.

17. Route P3 and P8 connectors of cable 3W17 (18) along top of driver's side wall. Bundle and stow connectors behind instrument panel. Secure branch of cable to existing vehicle wiring harness using cable fastener (item 3, 12, 13, or 14, Appendix F) as required.
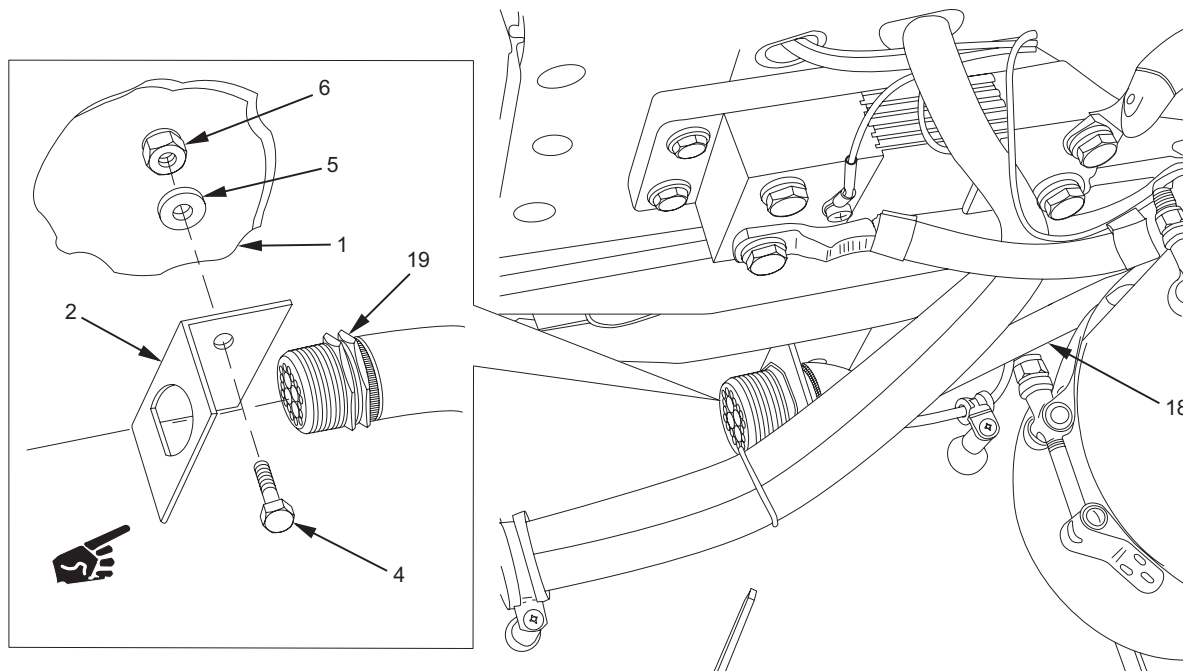
18. Route J1 connector of cable 3W17 (18) to rear right corner, behind fire extinguisher, and down side of battery box (1) to cable bracket (2).

19. If removed, install cable bracket (2), two hexagon head capscrews (4), two flat washers (5), and two new self-locking nuts (6) on battery box (1).

20. Install J1 connector (19) in cable bracket (2).

4-14. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).
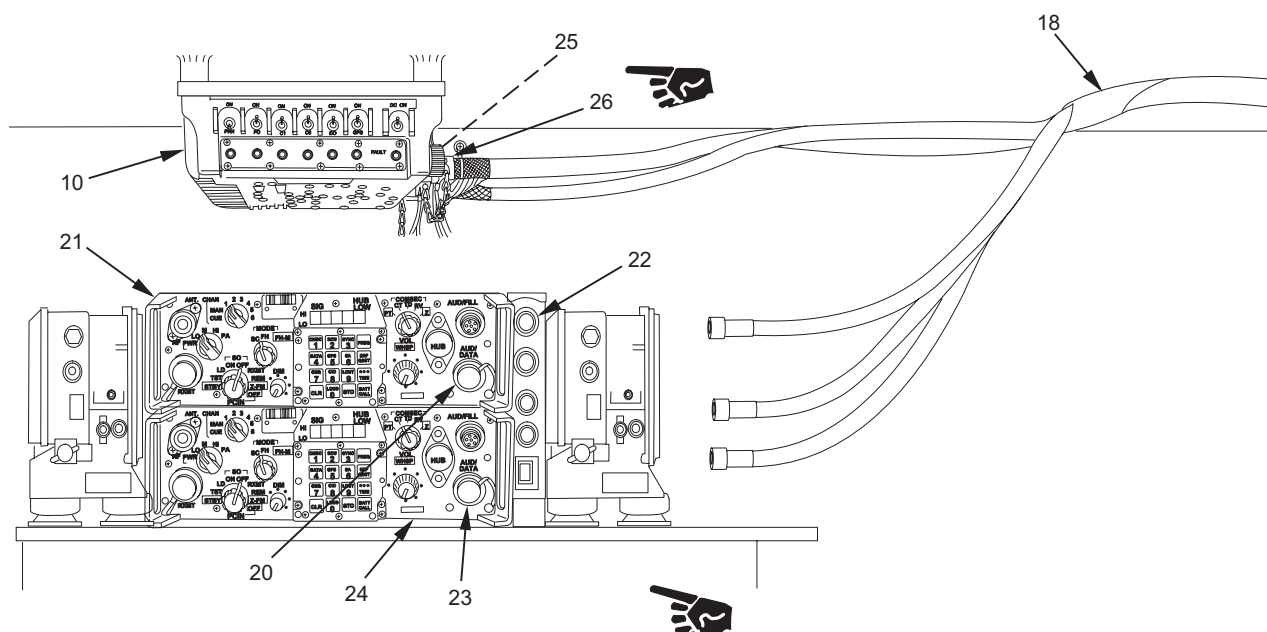
WARNING

Ensure power is turned off at power distribution assembly before connection of cable.

NOTE

Refer to Appendix H for radio setup procedures.

Refer to TM 11-5820-890-10-7 for information about the SINCGARS radio.

21. Connect P1 connector of cable 3W17 (18) to AUDIO/DATA connector (20) on top SINCGARS radio (21).

22. Connect P7 connector of cable 3W17 (18) to J6 connector (22) on top SINCGARS radio (21).

23. Connect P2 connector of cable 3W17 (18) to AUDIO/DATA connector (23) on bottom SINCGARS radio (24).

24. Connect P5 connector of cable 3W17 (18) to J3 connector (25) of PDA (10).

25. Connect P4 connector of cable 3W17 (18) to J2 connector (26) of PDA (10).
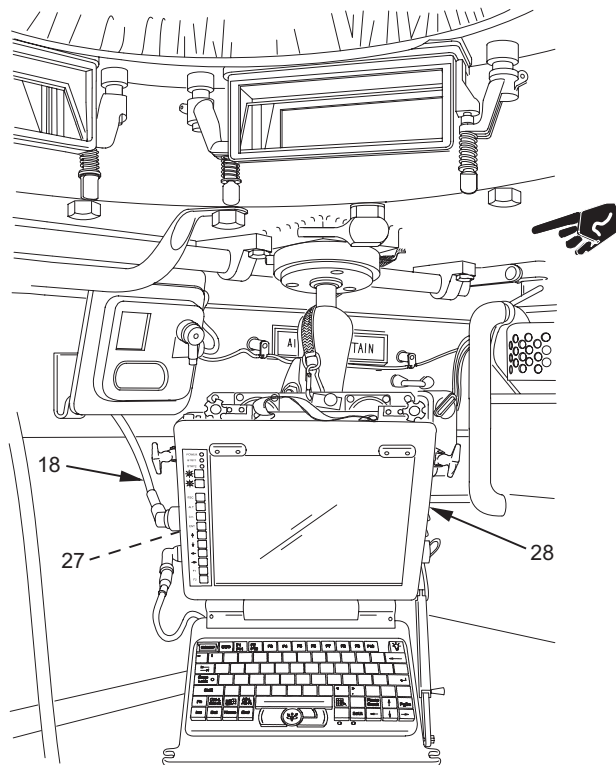
26. Route P6 branch of cable 3W17 (18) along top of bulkhead wall of vehicle toward mounted ram mount. Route above intercom box.

27. Connect P6 connector of cable 3W17 (18) to J1 connector (27) of computer (28).
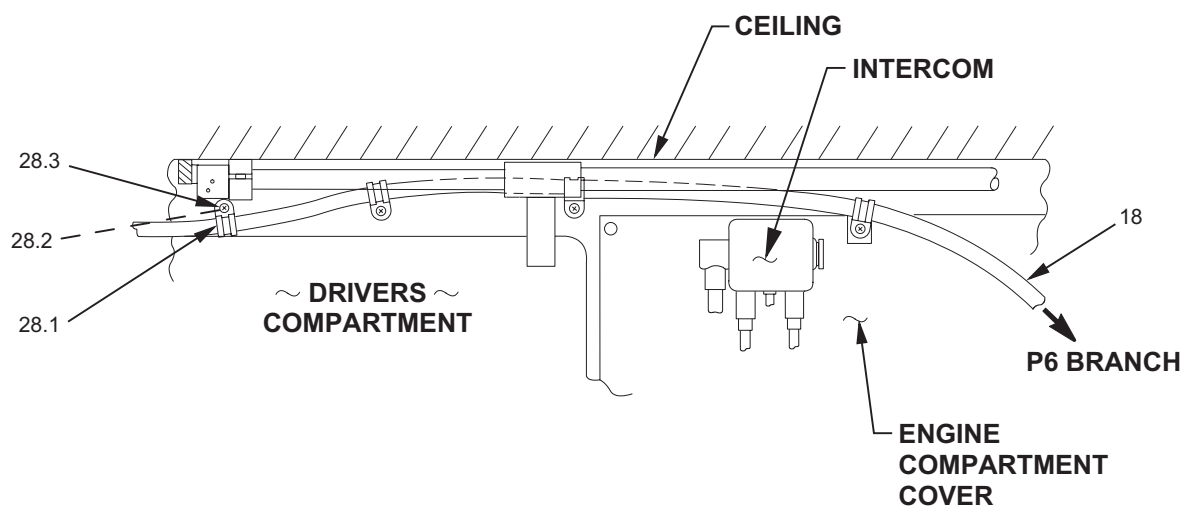
28. Secure cable 3W17 (18) to existing standoffs with four loop clamps (28.1) (item 3.1, Appendix F), four internal-tooth washers (28.2), and four machine screws (28.3).

4-14. MORTAR BALLISTIC COMPUTER (MBC) CABLES (cont).

NOTE

Steps 29 and 30 apply to cable 34W4, cable for VAC power usage.
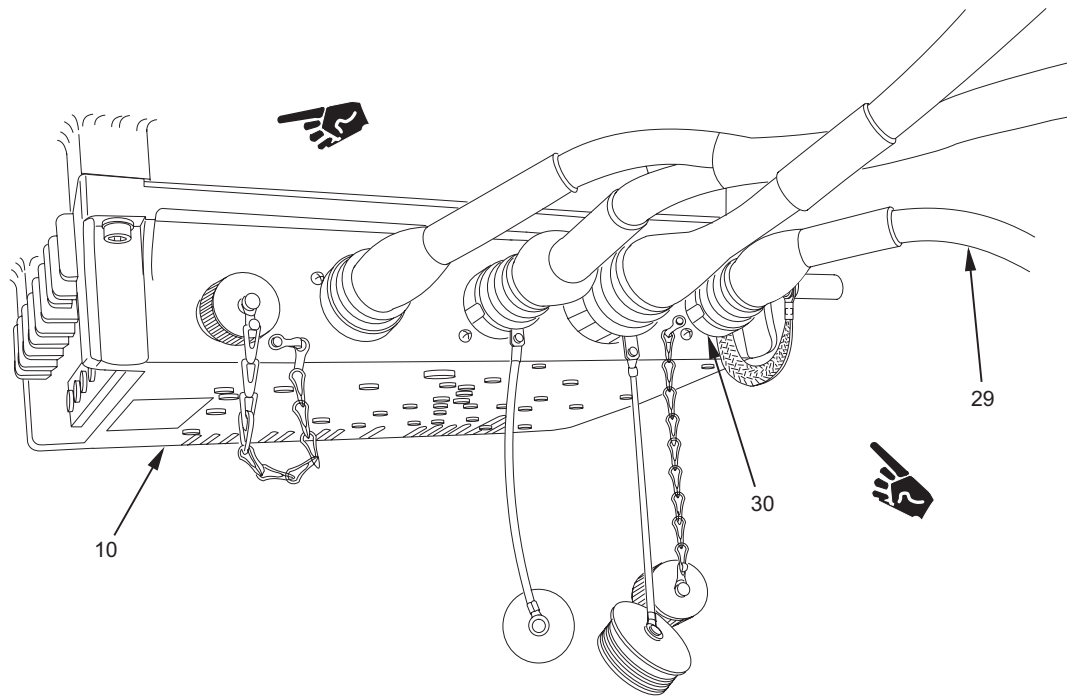
WARNING

Ensure power is turned off at power distribution assembly before connection of cable.

29. Connect P2 connector of cable 34W4 (29) to J5 connector (30) of PDA (10) and stow cable.

30. Connect cable 34W4 (29) to 120 VAC power source when AC use is desired.

CHAPTER 5
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. TROUBLESHOOTING

5-1. GENERAL.

   a. Troubleshooting procedures are limited to those listed in the troubleshooting symptom index. Table 5-1 lists the common malfunctions which you may find during the operation or maintenance of the Mortar Ballistic Computer System or its components. You should perform the tests/inspections and corrective actions in the order listed.

   b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

5-1.1. SYMPTOM INDEX.

NOTE

This symptom index can only be used as a general reference to troubleshooting. Troubleshoot your mortar ballistic computer system in the order shown by the steps. Always do the functional test first in order to verify the symptom. After repair, repeat the functional test to verify proper function.

After replacement of TCIM card, partial test of TCIM system can be performed off vehicle. After replacement of hard drive, software download can be verified off vehicle. To ensure full functionality of system, install repaired line replaceable unit (LRU) on vehicle and perform all procedures necessary to prove full mission capability.

5-1.2. TROUBLESHOOTING PROCEDURES.

Table 5-1. Direct Support Troubleshooting Procedures.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

MORTAR BALLISTIC COMPUTER (MBC) SYSTEM

NOTE

Prior to notification of primary item manager, attempt to reload software.

1. **MORTAR BALLISTIC COMPUTER (MBC) HAS POWER BUT WILL NOT BOOT UP (WINDOWS NT OPERATING SYSTEM BANNER APPEARS), IS LOCKED UP, NO SOFTWARE APPEARS, KEYBOARD WILL NOT OPERATE, OR LIQUID CRYSTAL DISPLAY (LCD) FLICKERS (M577 AND M1064).**

   Step 1. Perform full system restart of MBC to confirm fault.

   Step 2. If problem persists, replace hard drive. See paragraph 5-6.

   Step 3. Perform functional test of MBC.

   - If function test passes, return MBC to service.

   - If function test fails, notify primary item manager for instructions. See paragraph 5-3.

2. **MORTAR BALLISTIC COMPUTER (MBC) HAS POWER BUT WILL NOT BOOT TO BANNER SCREEN.**

   Step 1. Reload MBC software (see paragraph 5-7) and continue with Step 2.

   Step 2. Power down MBC and disconnect maintenance support device (MSD). Perform functional test of MBC.

   - If problem is corrected, return MBC to service.

   - If problem is not corrected, continue with Step 3.

   Step 3. Replace hard drive. See paragraph 5-6. Perform functional test.

   - If function test passes, return MBC to service.

   - If function test fails, notify primary item manager for instructions. See paragraph 5-3.

3. **FAILURE TO LOAD COMMUNICATION SOFTWARE; "COMMO INITIALIZATION FAILED - DEFAULTING TO MANUAL MODE" MESSAGE APPEARS.**

   Step 1. Reload MBC software (see paragraph 5-7) and continue with Step 2.

Table 5-1. Direct Support Troubleshooting Procedures (cont).

MALFUNCTION

    TEST OR INSPECTION

        CORRECTIVE ACTION

MORTAR BALLISTIC COMPUTER (MBC) SYSTEM (cont)

Step 2. Power down MBC and disconnect maintenance support device (MSD). Perform functional test of MBC.

- If problem is corrected, return MBC to service.

- If problem is not corrected, continue with Step 3.

Step 3. Replace TCIM card. See paragraph 5-6. Perform functional test.

- If function test passes, return MBC to service.

- If function test fails, notify primary item manager for instructions. See paragraph 5-3.

4. **AFTER SUCCESSFUL BOOT-UP/COMMUNICATION SOFTWARE LOADING, "NO COMMO" ERROR APPEARS WHEN TRANSMITTING OR RECEIVING DIGITAL MESSAGE TRAFFIC OR ESTABLISHED DIGITAL COMMUNICATIONS FAIL.**

Step 1. Perform full system restart of mortar ballistic computer (MBC) to confirm fault.

Step 2. If problem persists, replace TCIM card. See paragraph 5-6.

Step 3. Perform functional test of MBC.

- If function test passes, return MBC to service.

- If function test fails, notify primary item manager for instructions. See paragraph 5-3.

5. **DATA ENTERED INTO MORTAR BALLISTIC COMPUTER (MBC) DOES NOT MATCH DATA DISPLAYED ON LIQUID CRYSTAL DISPLAY (LCD) SCREEN OR DATA DOES NOT APPEAR ON LCD SCREEN.**

Step 1. Reload MBC software (see paragraph 5-7) and continue with Step 2.

Step 2. Power down MBC and disconnect maintenance support device (MSD). Perform functional test of MBC.

- If problem is corrected, return MBC to service.

- If problem is not corrected, continue with Step 3.

Step 3. Replace hard drive. See paragraph 5-6. Perform functional test.

- If function test passes, return MBC to service.

- If function test fails, notify primary item manager for instructions. See paragraph 5-3.

Section II. MAINTENANCE PROCEDURES

5-2. INTRODUCTION.

Maintenance procedures for the mortar ballistic computer (MBC) will consist of processing defective computers for repair or replacement in accordance with Repair Parts and Special Tools List, Appendix C.

5-3. MBC MAINTENANCE.

1.   Determine if the defective Line Replaceable Unit(s) (LRUs, MBC and/or power distribution assembly (PDA)) is under warranty. Refer to DA Form 2408-9, Equipment Control Record, for effective date in Block 23.

2.   Contact the Primary Item Manager for return and disposition instructions. The telephone number is DSN 793-6481, Commercial (309) 782-6481.

3.   If LRU(s) is not under warranty, replace or repair in accordance with Repair Parts and Special Tools List, Appendix C. Refer to paragraph 5-6 for replacement of computer hard drive and/or TCIM card.

5-4. POWER DISTRIBUTION ASSEMBLY.

This task covers:

a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
Electronic repairman tool kit, SC 5180-92-B04
Portable arc welder, PN 10000G

References
MIL-STD-372

Equipment Conditions
Power distribution assembly (PDA) removed from standoffs (paragraph 4-12)

REMOVAL

> ⬛ **WARNING**

When grinding metal, always wear safety glasses for eye protection. Use a disposable face
mask when dust and/or vapors are present.

1. If four standoffs (1) are damaged, grind weld (2) until weld can be broken with hammer. Discard damaged
standoffs and four helicoil inserts (3).
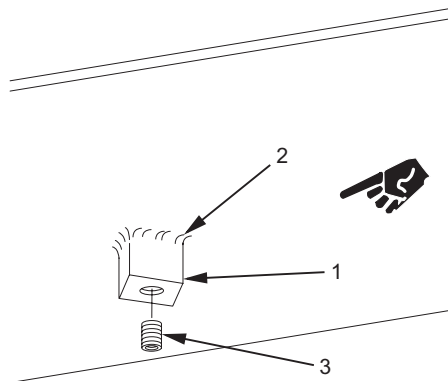
2. Continue grinding until mounting surface is smooth.

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

NOTE

If standoffs are being installed in vehicle for the first time, proceed with step 1. If standoffs are being replaced, proceed to step 4.

1. Choose location for PDA approximately 2.0 in. (5.1 cm) from the roadside wall of vehicle and 17.25 ± 0.12 in. (43.82 ± 0.30 cm) from roadside forward beam.

2. Remove cable straps from existing cables on side of vehicle. Remove loop clamps from two standoffs and move cables.

3. Position PDA on roof of vehicle and mark location of four holes for mounting hardware. Remove PDA.

WARNING

When grinding metal, always wear safety glasses for eye protection. Use a disposable face mask when dust and/or vapors are present.

4. Remove paint from area marked for welding of standoffs.

5. Position four standoffs (1) and weld into place in accordance with MIL-STD-372.

6. Install four new helicoil inserts (3) into four standoffs (1).

5-5. COMPUTER MOUNTING BRACKET.

This task covers:

    a. Removal   **b.** Inspection/Repair   **c.** Installation

INITIAL SETUP

Tools/Special Tools
    Electronic repairman tool kit, SC 5180-92-B04
    Portable arc welder, PN 10000G

References
    MIL-STD-372

Equipment Conditions
    Computer mounting bracket and bottom mounting block removed (paragraph 4-13)

REMOVAL

WARNING

    When grinding metal, always wear safety glasses for eye protection. Use a disposable face
    mask when dust and/or vapors are present.

1.   If top mounting block (1) is damaged, grind weld (2) until weld can be broken with hammer. Discard
     damaged mounting block and four helicoil inserts (3).
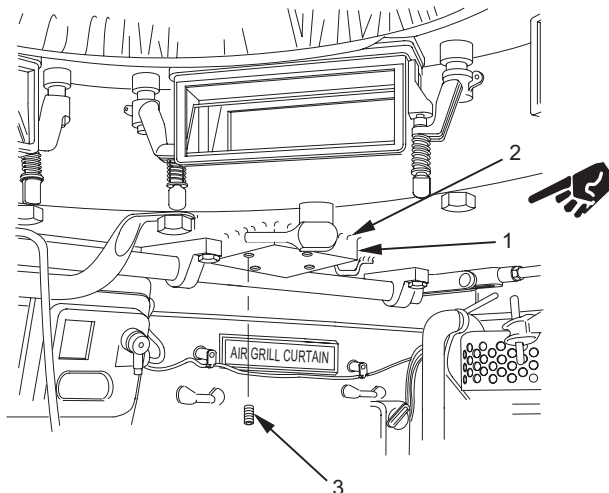
2.   Continue grinding until mounting surface is smooth.

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

NOTE

If top mounting block is being installed in vehicle for the first time, proceed with step 1. If top mounting block is being replaced, proceed to step 3.

1. Choose location for computer mounting bracket on roof of vehicle approximately 25.5 in. (64.8 cm) from the curbside wall of vehicle and approximately 7.5 in. (19.1 cm) from engine compartment wall.

2. Position top mounting block (1) on roof and scribe a square around the mounting block. Remove mounting block.

WARNING

When grinding metal, always wear safety glasses for eye protection. Use a disposable face mask when dust and/or vapors are present.

3. Remove paint from area marked for welding of top mounting block (1).

4. Position top mounting block (1) and weld into place in accordance with MIL-STD-372.

5. Install four new helicoil inserts (3) into top mounting block (1).

5-6. COMPUTER.

This task covers:

a. Electrostatic Discharge (ESD) Precautions
b. Removal
c. Inspection/Repair
d. Installation

INITIAL SETUP

Tools/Special Tools
Electronic repairman tool kit, SC 5180-92-B04
Electrostatic discharge pad (item 8, Appendix B)

Materials/Parts
Non-conductive electrical tape (item 15, Appendix F)

Equipment Conditions
TCIM and/or hard drive access covers removed (paragraph 4-9)
Internal batteries removed from computer (paragraph 3-5)

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

1.   Use wrist ground straps or manual grounding procedures.

2.   Keep ESDS items in protective covering when not in use.

3.   Ground all electrical tools and test equipment.

4.   Periodically check continuity and resistance of grounding system.

5.   Use only metalized solder suckers.

6.   Handle ESDS items only in protected areas.

REMOVAL

CAUTION

This equipment contains parts and assemblies sensitive to damage by electrostatic discharge (ESD). Use ESD precautionary procedures when touching or removing TCIM card or hard drive. Use of metallic tools is prohibited.

NOTE

Steps 1 through 3 apply to TCIM card.

CAUTION

To prevent damage to TCIM card and circuit card, use of non-conductive material tools is **mandatory**.
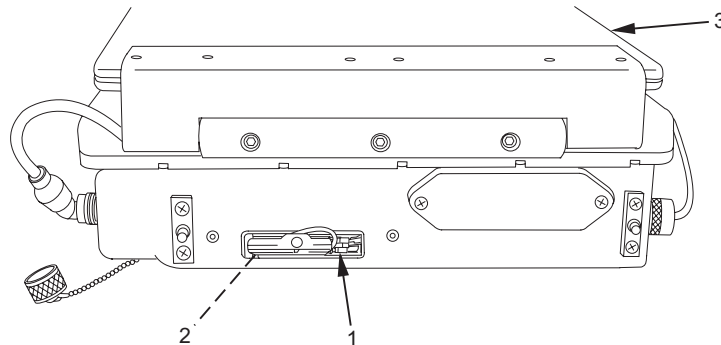
1. Using non-conductive screwdriver, press on gray release latch (1). Observe that TCIM card (2) detaches from slot of computer (3).
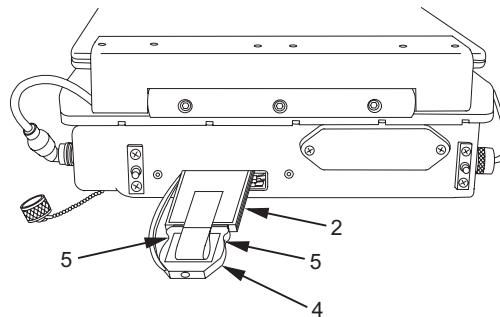
2. Carefully pull wires and wiring harness (4), with attached TCIM card (2), from slot.

3. Press two latches (5), on either side of wiring harness (4), remove TCIM card (2) from wiring harness, and complete removal of TCIM card from slot. Use of pull tab, if present on TCIM card, will aid the removal.

5-6. COMPUTER (cont).

NOTE

Step 4 applies to hard drive.
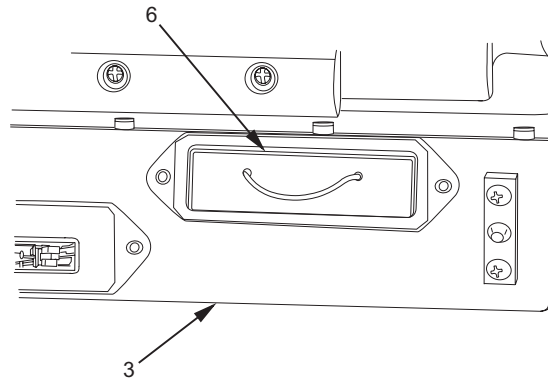
4.   Grasp string handle of hard drive (6) and pull from computer (3).

INSPECTION/REPAIR

Replace defective parts as authorized in Repair Parts and Special Tools List, Appendix C.

INSTALLATION

CAUTION

This equipment contains parts and assemblies sensitive to damage by electrostatic discharge (ESD). Use ESD precautionary procedures when touching or installing hard drive or TCIM card. Use of metallic tools is prohibited.

NOTE

Steps 1 through 5 apply to hard drive.
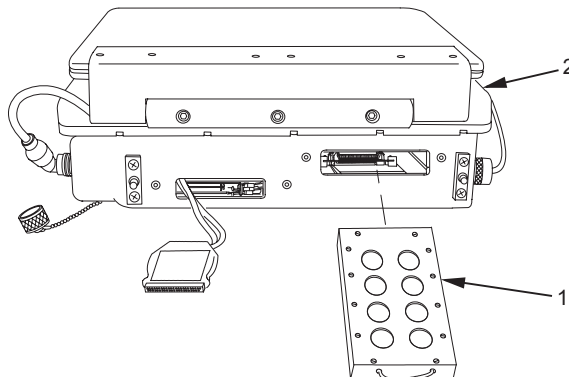
1.   Position hard drive (1) with holes facing up and align with slot in computer (2).

2. Ensure that channels on hard drive (1) fit under the edges of slide in slot of computer (2) and carefully push into slot.

3. Ensure that hard drive (1) is securely seated.

4. Install hard drive access cover (paragraph 4-9).

5. Perform functional check of hard drive during boot-up to observe if M31 MBC banner screen appears. If screen does not appear, perform software download. See paragraph 5-7.

NOTE

Steps 6 through 13 apply to TCIM card.
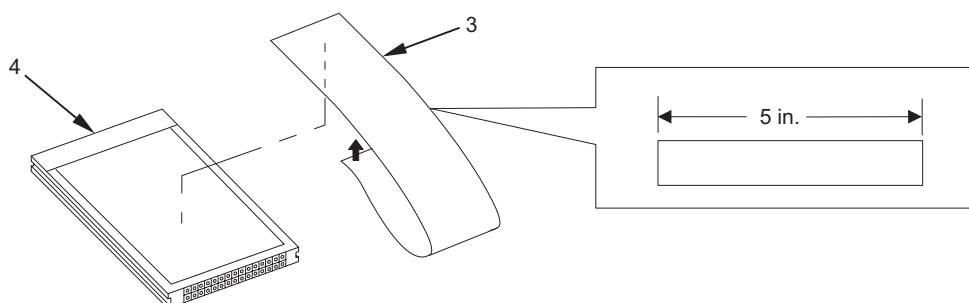
6. Obtain 5 in. (12.7 cm) piece of non-conductive electrical tape (3) (item 15, Appendix F) and apply one end of tape to TCIM card (4). Fold other end of tape back with adhesive sides of tape together to form pull tab approximately 2 in. (5.1 cm) in length.
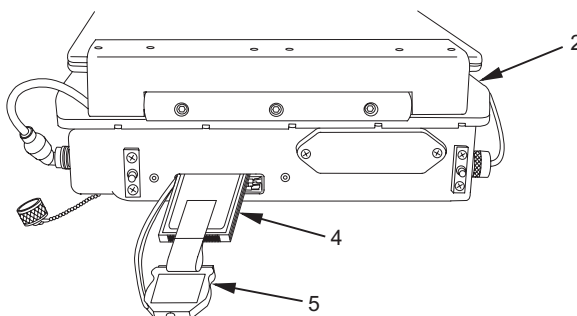
7. Establish mating points of TCIM card (4) and wiring harness (5), but do not connect.

8. Align TCIM card (4) in lower slot of computer (2), ensuring that channels are in grooves.

9. Push TCIM card (4) into computer (2) as far as possible while retaining finger hold.

CAUTION

Exercise care during assembly and installation of wiring harness and TCIM card to avoid damage to pins, TCIM card, and wiring. Use of metallic tools is prohibited.

10. Attach wiring harness (5) onto TCIM card (4) and carefully push TCIM card and wiring harness into seated position.

11. Install TCIM access cover (paragraph 4-9).

5-6. COMPUTER (cont).

12. Perform partial functional test of TCIM card installation off vehicle using the following steps:

   a. Power up to banner screen.

   b. Press CONTINUE (F4).

   c. If "ENABLING DIGITAL COMMUNICATION, PLEASE WAIT..." message appears at top of screen, loading of TCIM is being attempted. When this message disappears and no error message is indicated at bottom of screen, the TCIM has loaded successfully and partial functional test is completed successfully. A full functional test must be done "On Vehicle".

   d. If "ENABLING DIGITAL COMMUNICATION, PLEASE WAIT..." message appears and is followed by the error message "COMMO INITIALIZATION FAILED — DEFAULTING TO MANUAL MODE" at bottom of screen, TCIM is loose, missing, or defective.

   e. If "ENABLING DIGITAL COMMUNICATION, PLEASE WAIT..." message does not appear, perform the following steps:

   (1) On the SETUP screen, enter "CD" in the TGT NUMBER PREFIX field and enter "E 020" in the GRID DECLINATION field. Press USE ALL (F2).

   (2) On the SECTION SELECTION screen, highlight SECTION A and press SELECT (F1).

   (3) On the WEAPON SYSTEM SELECTION screen, highlight 120 MM/M120 and press SELECT (F1).

   (4) On the SECTION DATA screen, highlight SECTION AZIMUTH and enter "1600" in the field. Press ACCEPT (F2) and then USE ALL (F2).

   (5) On the DEFINED WEAPONS screen, press FINISHED (F2).

   (6) On the AMMUNITION PRE-SELECT 120 MM/M120 screen, press USE ALL (F2).

   (7) On the AMMO INVENTORY 120 MM/M120 screen, press FINISHED (F2).

   (8) On the MBC MAIN MENU screen, highlight COMMUNICATION MENU and press SELECT (F1).

   (9) On the COMMUNICATION MENU screen, highlight COMMUNICATION SETUP and press SELECT (F1).

   (10) On the COMMUNICATION SETUP screen, enter "M" in the UNIT NET ID field and press ACCEPT (F2). Enter "XX" in the DEFAULT AUTH CODE field and press ACCEPT (F2). Press USE ALL (F2).

   (11) "ENABLING DIGITAL COMMUNICATION, PLEASE WAIT..." message will appear at top of screen. Loading of TCIM is being attempted. When this message disappears and no error message is indicated at bottom of screen, the TCIM has loaded successfully and partial functional test is completed successfully. A full functional test must be done "On Vehicle".

   f. If the error message "COMMO INITIALIZATION FAILED — DEFAULTING TO MANUAL MODE" appears at bottom of screen, TCIM is loose, missing, or defective.

13. Complete functional check will be performed with computer installed in vehicle by verifying communication with another subscriber.

5-7. COMPUTER SOFTWARE DOWNLOAD.

This task covers:

  a. Download of Software

INITIAL SETUP

Tools/Special Tools
    Cable breakout adapter (item 2, Appendix D (Basic Issue Items))
    Ethernet crossover cable (item 5, Appendix B)
    Maintenance support device (MSD) (item 6, Appendix B)
    XM31 MBC Downloader CD (item 7, Appendix B)

DOWNLOAD OF SOFTWARE
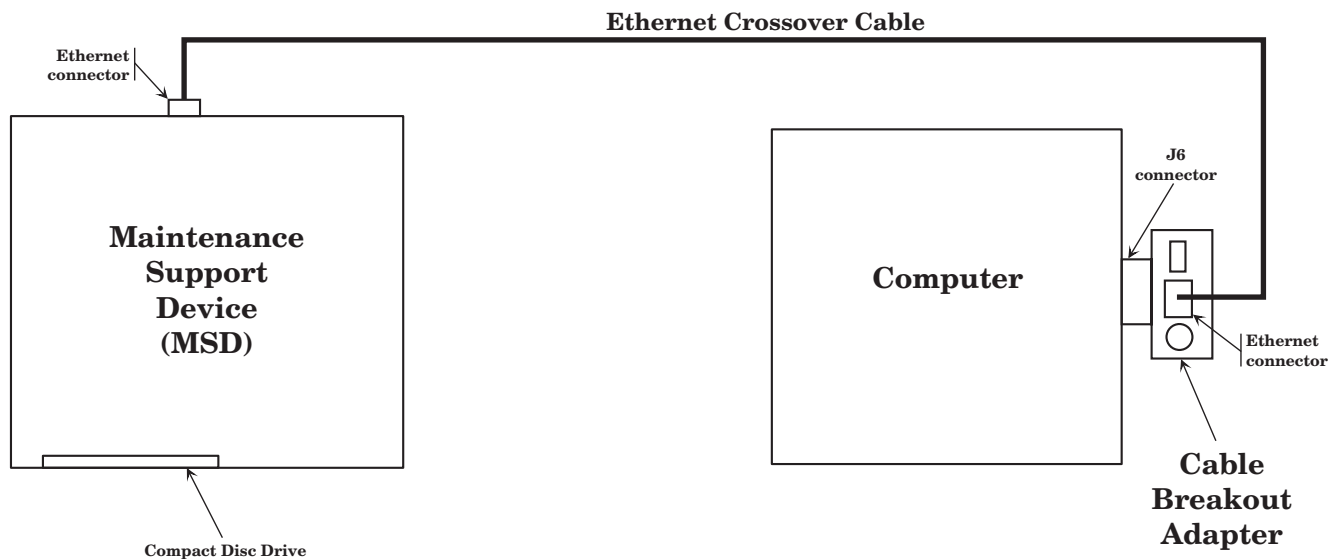
When software downloading is required, it shall be performed using the following equipment: maintenance support device (MSD), Ethernet crossover cable, cable breakout adapter, and XM31 MBC Downloader CD.

The MSD is used to upgrade software when required and will also be used as a troubleshooting tool.

5-7. COMPUTER SOFTWARE DOWNLOAD (cont).

Insert the compact disc (CD) into the MSD drive. The CD should autorun. If it does not autorun, follow instructions on the CD label to launch the MBC Software Downloader application. When the Software Downloader starts, a screen will appear that shows three buttons from which to choose.

| MORTAR BALLISTIC COMPUTER |

| MBC OPERATING SYSTEM |

| SYSTEM LOGS |

The purpose of the MORTAR BALLISTIC COMPUTER button is to download MBC application software to the computer in the event of software upgrades. The program also checks for version compatibility of the operating system (OS) software; it does not check for integrity/corruption of the OS software.

The purpose of the MBC OPERATING SYSTEM button is to download operating system software.

The SYSTEM LOGS button is a retrieval system for the record of all previous downloads using the MSD. This requires no user action. The software developer may require information from the log when technical support is requested.

During normal software upgrades, choose the option "MORTAR BALLISTIC COMPUTER" and follow all on-screen instructions to perform the download.

NOTE

When performing this procedure as a troubleshooting corrective action, perform the download for "MBC OPERATING SYSTEM" first and then perform the download for "MORTAR BALLISTIC COMPUTER".

On the first screen of either the MBC application software or the OS software download, user will be asked for serial number of computer and for unit ID. Unit ID will typically be the owning unit.

If replacement of the CD is necessary, notify ARDEC at DSN 880-7261, Commercial (973) 724-7261, E-Mail: atst-support@pica.army.mil. The Website is http://atst.pica.army.mil/atst/sport.

APPENDIX A
REFERENCES

A-1. SCOPE.

This appendix lists all forms, supply catalogs, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS.

Computer's Record ....DA Form 2399

Data Sheet ....DA Form 2188-R

Equipment Control Record.. DA Form 2408-9

Equipment Inspection and Maintenance Worksheet ....DA Form 2404

Product Quality Deficiency Report... SF 368

Recommended Changes to Publications and Blank Forms ....DA Form 2028

Report of Discrepancy (ROD).. SF 364

A-3. FIELD MANUALS.

First Aid for Soldiers..FM 21-11

Forward Observers Manual ....FM 6-30

NBC Decontamination ....FM 3-5

NBC Defense ....FM 41-20

Nuclear, Biological, and Chemical (NBC) Protection..FM 3-4

Nuclear, Biological, and Chemical (NBC) Reconnaissance
    and Decontamination Operations...FM 3-87

A-4. TECHNICAL MANUALS.

Administrative Storage of Equipment .... TM 740-90-1

Operator's Manual for Welding Theory and Application ....TM 9-237

Procedures for Destruction of Electronics Materiel to Prevent
    Enemy Use (Electronics Command) .... TM 750-244-2

Procedures for Destruction of Equipment in the Federal Supply Classification 1220
    to Prevent Enemy Use.. TM 750-244-7

SINCGARS ICOM Ground Radios, Used with Automated Net Control Device (ANCD)
    AN/CYZ-10 and Precision Lightweight GPS Receiver (PLGR) AN/PSN-11, Net
    Control Station (NCS) Pocket Guide...TM 11-5820-890-10-7

A-5. MISCELLANEOUS PUBLICATIONS.

Army Materiel Maintenance Concepts and Policies ....AR 750-1

Army Medical Department Expendable/Durable Items..CTA 8-100

Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items)................CTA 50-970

Functional Users Guide for the Army Maintenance Management System (TAMMS).............DA PAM 738-750

Welding, Gas Metal-Arc and Gas Tungsten-Arc, Aluminum Alloys, Readily
    Weldable for Structures, Excluding Armor MIL-STD-372

APPENDIX B
MAINTENANCE ALLOCATION CHART (MAC)

B-1. GENERAL.

This introduction provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

The Maintenance Allocation Chart (MAC) immediately following the introduction designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit............................Includes two subcolumns, C (operator/crew) and O (unit) maintenance

Direct Support ....Includes an F subcolumn

General Support.........Includes an H subcolumn

Depot.........................Includes a D subcolumn

The tools and test equipment requirements (immediately following the MAC) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks (immediately following the tools and test equipment requirements) contain supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS.

Maintenance functions will be limited to and defined as follows:

   a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

   b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

   c. Service. Operations required periodically to keep an item in proper operating condition, e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

   d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

   e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

B-2. MAINTENANCE FUNCTIONS (cont).

    f.   Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

    g.   Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

    h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.

    i.   Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

NOTE

        The following definitions are applicable to the "repair" maintenance function:

        Service - Inspect, test, service, adjust, align, calibrate, and/or replace.

        Fault location/troubleshooting - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

        Disassembly/assembly - The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

        Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

    j.   Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

    k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC.

a.   Column (1) - Group Number. Column (1) lists functional group code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

b.   Column (2) - Component/Assembly. Column (2) contains the item names of components, assemblies, sub-assemblies, and modules for which maintenance is authorized.

c.   Column (3) - Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For detailed explanation of these functions, refer to "Maintenance Functions" outlined above.)

d.   Column (4) - Maintenance Level. Column (4) specifies each level of maintenance authorized to perform the function listed in column (3), by indicating work time required. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures will be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

C - Operator or Crew Maintenance

O - Unit Maintenance

F - Direct Support Maintenance

L - Specialized Repair Activity (SRA)

H - General Support Maintenance

D - Depot Maintenance

NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by a work time figure in the "H" column of column (4), and an associated reference code is used in the REMARKS column (6). The code is keyed to the remarks and the SRA complete repair application is explained there.

e.   Column (5) - Tools and Test Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

f.   Column (6) - Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

B-4. EXPLANATION OF COLUMNS IN TOOLS AND TEST EQUIPMENT REQUIREMENTS.

a. Column (1) - Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in Column (5) of the MAC.

b. Column (2) - Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column (3) - Nomenclature. Name or identification of the tool or test equipment.

d. Column (4) - National Stock Number (NSN). The NSN of the tool or test equipment.

e. Column (5) - Tool Number. The manufacturer's part number, model number, or type number.

B-5. EXPLANATION OF COLUMNS IN THE REMARKS.

a. Column (1) - Remarks Code. The code recorded in column (6) of the MAC.

b. Column (2) - Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

Maintenance Allocation Chart
for M31 Mortar Ballistic Computer

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT C	UNIT O	DS F	GS H	DEPOT D		
00	Computer System, Mortar Ballistic, M31, M577 12992850	Inspect Test Service Repair Replace	0.2 0.1 0.1 0.1	0.1 0.7	0.2 0.2			1, 2	
01	Computer System, Mortar Ballistic, M31, M1064 12992851	Inspect Test Service Repair Replace	0.2 0.1 0.1 0.1	0.1 0.7	0.2 0.2			1, 2	
02	Computer, Mortar Ballistic, M31 12992843	Inspect Service Replace Repair	0.1	0.1 0.1	0.2 0.6 0.5 0.3			2, 3 5, 6, 7 8	A A
03	Power Distribution Assembly 12992895	Inspect Replace	0.1	0.4				2, 3	
04	Cable Hanger 12992809	Inspect Replace	0.1	0.5				2	
05	Mounting Block, Top 12987812	Inspect Replace	0.1	0.5				2, 3	
06	Mounting Block, Bottom 12987813	Inspect Replace	0.1	0.1				2	
07	Support Bracket 12992815	Inspect Replace	0.1	0.5				2	

**Tools and Test Equipment
for M31 Mortar Ballistic Computer**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
1	F	Case, Transit	5895-01-793-3489	
2	O	Tool Kit, Electronic Repairman	5180-00-999-5943	SC 5180-92-B04
3	O	Welder, Arc, Portable	5130-01-482-1692	10000G
4	O	Multimeter, Digital	6625-01-265-6000	ANPSM45A
5	F	Cable, Crossover, Ethernet		13005980
6	F	Maintenance Support Device (MSD)	6625-01-493-8984	AN PSM 95B
7	F	XM31 MBC Downloader CD	N/A	13005982
8	F	Electrostatic Discharge Pad (with Equipment)	4940-01-250-4236	M87893B-02 (81349)

**Remarks
for M31 Mortar Ballistic Computer**

REMARKS CODE	REMARKS
A	Electrostatic discharge pad is required for TCIM card and hard drive removal.

APPENDIX C
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

SECTION I. INTRODUCTION

C-1. SCOPE.

This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of operator, unit, and direct support maintenance of the Mortar Ballistic Computer (MBC). It authorizes the requisitioning, issue, and disposition of spares, repair parts, and special tools as indicated by the source, maintenance and recoverability (SMR) codes.

C-2. GENERAL.

In addition to Section I, Introduction, this repair parts and special tools list is divided into the following sections:

a.   Section II. Repair Parts List. A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Bulk materials are listed by item name in FIG. BULK at the end of the section. Repair parts kits or sets are listed separately in their own functional group within Section II. Repair parts for repairable special tools are also listed in the section. Items listed are shown on the associated illustration.

b.   Section III. Special Tools List. A list of special tools, special TMDE, and special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in DESCRIPTION AND USABLE ON CODE (UOC) column) for the performance of maintenance.

c.   Section IV. Cross-Reference Indexes. A list, in National item identification number (NIIN) sequence, of all National stock numbered items appearing in the listings, followed by a list in alphanumeric sequence of all part numbers appearing in the listing. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance. The figure and item number index lists figure and item numbers in alphanumeric sequence and cross-references NSN, CAGEC, and part numbers.

C-3. EXPLANATION OF COLUMNS (SECTIONS II AND III).

The columns in Sections II and III are explained as follows.

    a. Item No. - Column (1). Indicates the number used to identify items called out in the illustration.

    b. SMR Code - Column (2). The Source, Maintenance, and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance level authorization criteria, and disposition instruction, as shown in the following breakout:

Source Code	Maintenance Code	Recoverability Code
xx — 1st two positions	xx	x — 5th position
How you get an item	3rd position — Who can install, replace or use the item / 4th position — Who can do complete repair* on the item	Who determines disposition action on an unserviceable item
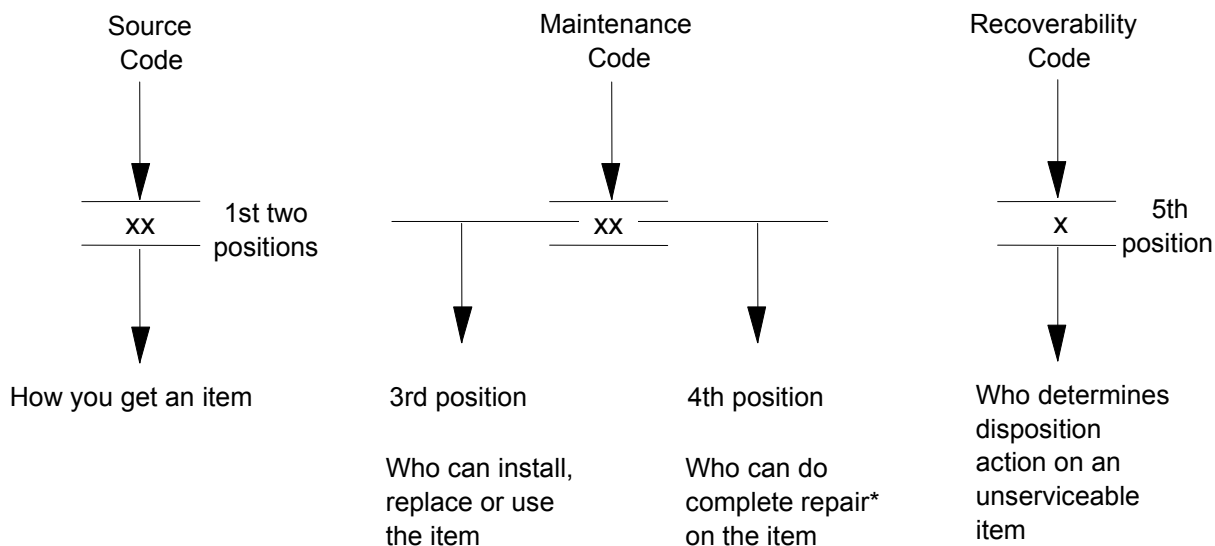
*Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

    (1) Source Code. The source code tells you how to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

Source Code   Application/Explanation

Source Code	Application/Explanation
PA PB PC** PD PE PF PG	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the level indicated by the code entered in the 3rd position of the SMR code. **NOTE: Items coded PC are subject to deterioration.
KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance level indicated in the 3rd position of the SMR code. The complete kit must be requisitioned and applied.

Source Code   Application/Explanation

MO - (Made at Org/
      AVUM Level)
MF - (Made at DS/
      AVIM Level)
ML - (Made at Special-
      ized Repair Act
      (SRA))
MD - (Made at Depot)

Items with these codes are not to be requested/requisitioned individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the bulk material group of the repair parts list in this RPSTL. If the item is authorized to you by the 3rd position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.

AO - (Assembled by
      Org/ AVUM Level)
AF - (Assembled by
      DS/AVIM Level)
AL - (Assembled by
      SRA)
AD - (Assembled
      by Depot)

Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the 3rd position code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.

XA - Do not requisition an "XA"-coded item. Order the next higher assembly. (Also, refer to the NOTE below.)

XB - If an "XB"-coded item is not available from salvage, order it using the CAGEC and part number given.

XC - Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.

XD - Item is not stocked. Order an "XD"-coded item through normal supply channels using the CAGEC and part number given, if no NSN is available.

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.

(2) Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to use and repair support items. The maintenance codes are entered in the third and fourth positions of the SMR Code as follows:

(a) The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to one of the following levels of maintenance.

Maintenance   Application/Explanation
   Code

C   -Crew or operator maintenance done within unit or aviation unit maintenance.

O   -Unit level/Aviation unit maintenance can remove, replace, and use the item.

C-3. EXPLANATION OF COLUMNS (SECTIONS II AND III) (cont).

Maintenance   Application/Explanation
   Code

   F   -Direct Support/Aviation intermediate maintenance can remove, replace, and use the
                   item.

   H   -General Support maintenance can remove, replace, and use the item.

   L   -Specialized repair activity can remove, replace, and use the item.

   D   -Depot level can remove, replace, and use the item.

        (b) The maintenance code entered in the fourth position tells whether or not the item is to be repaired
and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized
repair functions).

NOTE

   Some limited repair may be done on the item at a lower level of maintenance, if authorized by the
   Maintenance Allocation Chart (MAC) and SMR codes.

This position will contain one of the following maintenance codes.

Maintenance   Application/Explanation
   Code

   O   -Unit/Aviation unit is the lowest level that can do complete repair of the item.

   F   -Direct Support/Aviation intermediate is the lowest level that can do complete repair of
                   the item.

   H   -General Support is the lowest level that can do complete repair of the item.

   L   -Specialized repair activity is the lowest level that can do complete repair of the item.

   D   -Depot is the lowest level that can do complete repair of the item.

   Z   -Nonrepairable. No repair is authorized.

   B   -No repair is authorized. (No parts or special tools are authorized for the maintenance of
                   a "B" coded item.) However, the item may be reconditioned by adjusting, lubricating,
                   etc., at the user level.

(3) Recoverability Code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR Code as follows:

Recoverability Code	Application/Explanation
Z	-Nonrepairable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in 3rd position of SMR Code.
O	-Repairable item. When uneconomically repairable, condemn and dispose of the item at unit or aviation unit level.
F	-Repairable item. When uneconomically repairable, condemn and dispose of the item at the direct support or aviation intermediate level.
H	-Repairable item. When uneconomically repairable, condemn and dispose of the item at general support level.
D	-Repairable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L	-Repairable item. Condemnation and disposal not authorized below specialized repair activity (SRA).
A	-Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. CAGEC - Column (3). The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code which is used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

d. Part Number - Column (4). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the part ordered.

C-3. EXPLANATION OF COLUMNS (SECTIONS II AND III) (cont).

e. Description and Usable On Code (UOC) - Column (5). This column includes the following information:

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) The physical security classification of the item is indicated by the parenthetical entry which is a physical security classification abbreviation (e.g., Phy Sec C1 (C) - Confidential, Phy Sec C1 (S) - Secret, Phy Sec C1 (T) - Top Secret).

(3) Items that are included in kits and sets are listed below the name of the kit or set.

(4) Spare/repair parts that make up an assembled item are listed immediately following the assembled item line entry.

(5) Part numbers for bulk materials are referenced in this column in the line item entry for the item to be manufactured/fabricated.

(6) When the item is not used with all serial numbers of the same model, the effective serial numbers are shown on the last line(s) of the description (before UOC).

(7) The usable on code, when applicable. (See paragraph C-5, Special Information).

(8) In the special tools list section, the basis of issue (BOI) appears as the last line(s) in the entry for each special tool, special TMDE, and other special support equipment. When density of equipment supported exceeds density spread indicated in the basis of issue, the total authorization is increased proportionately.

(9) The statement "END OF FIGURE" appears just below the last item description in Column 5 for a given figure in both section II and section III.

f. Qty - Column (6). The QTY (quantity per figure column) indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

C-4. EXPLANATION OF COLUMNS (SECTION IV).

The columns in section IV are explained as follows.

a. National Stock Number (NSN) Index.

(1) Stock Number Column. This column lists the NSN by National item identification number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN.

When using this column to locate an item, ignore the first 4 digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

$$\frac{\overline{\text{NSN}}}{\underset{\text{NIIN}}{5385\text{-}\underline{01\text{-}574\text{-}1476}}}$$

(2) Fig. Column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in section II and section III.

(3) Item Column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. Part Number Index. Part numbers in this index are listed by part number in ascending alphanumeric sequence (i.e., vertical arrangement of letter and number combination which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

(1) CAGEC Column. The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(2) Part Number Column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

(3) Stock Number Column. This column lists the NSN for the associated part number and manufacturer identified in the PART NUMBER and CAGEC columns to the left.

(4) Fig. Column. This column lists the number of the figure where the item is identified/located in sections II and III.

(5) Item Column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

c. Figure and Item Number Index.

(1) Fig. Column. This column lists the number of the figure where the item is identified/located in sections II and III.

(2) Item Column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

(3) Stock Number Column. This column lists the NSN for the item.

(4) CAGEC Column. The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(5) Part Number Column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

C-5. SPECIAL INFORMATION.

All special information applicable to this RPSTL is listed below.

   a. Usable On Code. The usable on code appears in the lower left corner of the Description column heading. Usable on codes are shown as "UOC: . . ." in the Description Column (justified left) on the first line applicable item description/nomenclature. Uncoded items are applicable to all models. Identification of the usable on codes used in the RPSTL are:

Code	Used On
BF9	M577 MBC
BH8	M1064 MBC

   b. Fabrication Instructions. Bulk materials required to manufacture items are listed in the Bulk Material Functional Group of this RPSTL. Part numbers for bulk materials are also referenced in the description column of the line item entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source coded to be manufactured or fabricated are found in this manual.

   c. Index Numbers. Items which have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the National Stock Number/Part Number Index and the bulk material list in section II.

C-6. HOW TO LOCATE REPAIR PARTS.

Information on how to locate repair parts is as follows.

   a. When National Stock Number or Part Number is Not Known:

      (1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

      (2) Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

      (3) Third. Identify the item on the figure and use the Figure and Item Number Index to find the NSN.

   b. When National Stock Number or Part Number is Known:

      (1) First. Using the National stock number index or the part number index, find the pertinent National stock number or part number. The NSN index is in National item identification number (NIIN) sequence. The part numbers in the part number index are listed in ascending alphanumeric sequence. Both indexes cross-reference you to the illustration figure and item number of the item you are looking for.

      (2) Second. Turn to the figure and item number, verify that the item is the one you're looking for, and locate the item number in the repair parts list for the figure.

C-7. ABBREVIATIONS.

Not applicable.
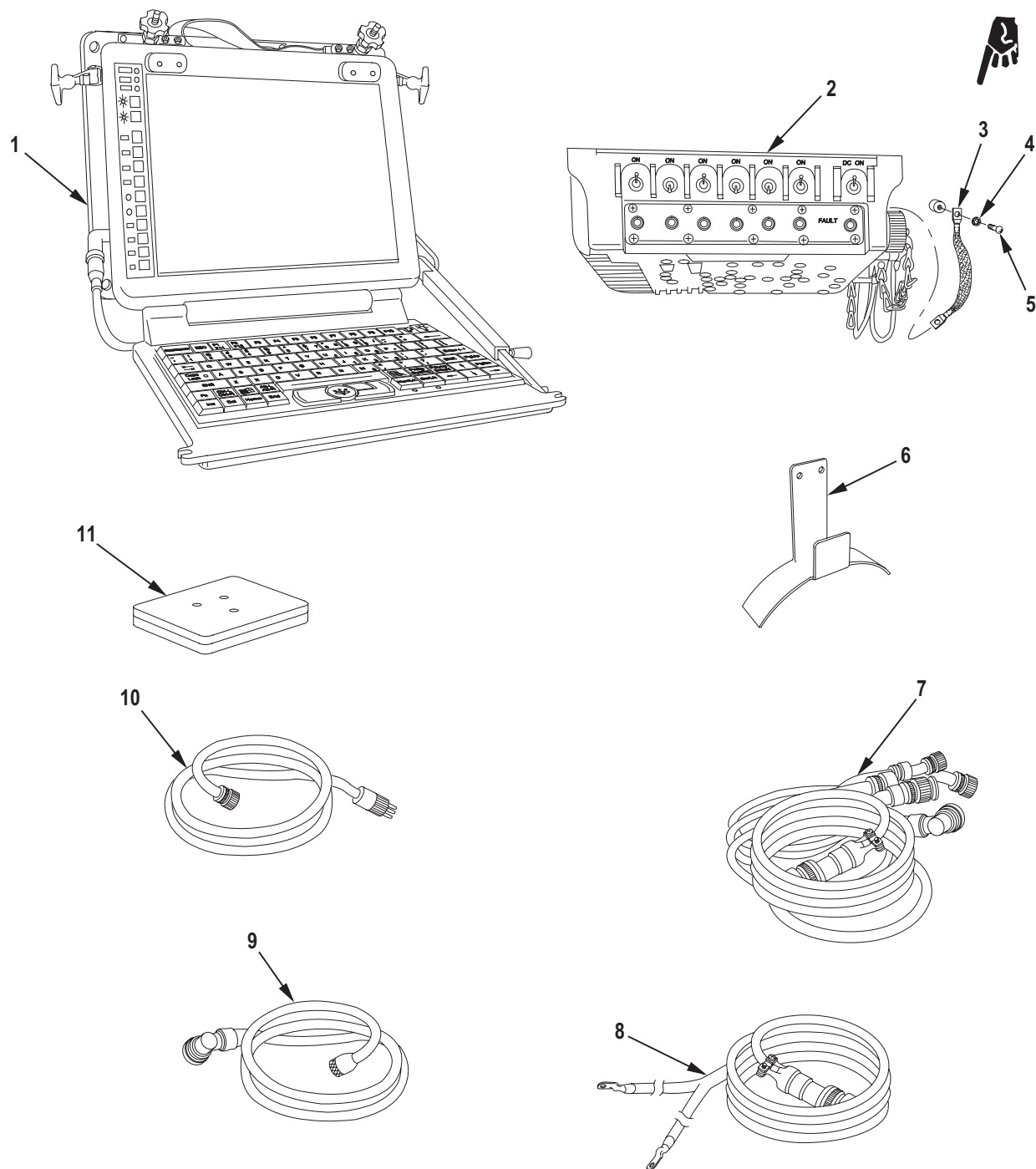
Figure C-1. M31 Mortar Ballistic Computer System, M577, 12992850.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODES(UOC)	QTY

GROUP 00

FIG.C-1 COMPUTER SYSTEM, MORTAR
BALLISTIC, M31, M577 P/N 12992850

1	PAODD	1220014856549	19200	12992843	COMPUTER,MORTAR BAL LISTIC,M31(SEE FIG.C-3 FOR BREAKDOWN)............... UOC:BF9	2
2	PAODD	6150014856552	19200	12992895	ASSEMBLY,POWER DIST RIBUTION(SEE FIG.C-4FOR ASSEMBLY BREAKDOWN)...... UOC:BF9	1
3	PAOZZ	6150015124826	19200	12992760	STRAP,GROUNDING TING(SEE FIG.C- ... UOC:BF9	1
4	PAOZZ	5310005501130	96906	MS35333-40	WASHER,L0CK......................... UOC:BF9	5
5	PAOZZ	5305009881724	96906	MS35206-280	SCREW,MACHINE,PANHD................. UOC:BF9	1
6	PAOZZ	5975014853470	19200	12992809	HANGAR,CABLE(SEE FI G.C-5 FOR ASSEMBLY BREAKDOWN)................. UOC:BF9	1
7	PAOZZ	5995014853472	19200	12992861	CABLE ASSEMBLY,POWE R (4W7)........ UOC:BF9	1
8	PAOZZ	5995014853474	19200	12992860	CABLE ASSEMBLY,SPEC IAL PURPOSE(4W6)........................ UOC:BF9	1
9	PAOZZ	5995014853471	19200	12992865	CABLE ASSEMBLY,SPEC IAL PURPOSE(34W2)....................... UOC:BF9	1
10	PAOZZ	5995014853467	19200	12992872	CABLE ASSEMBLY,POWE R,VAC(34W4).... UOC:BF9	1
11	PAOZZ	5340014853475	19200	12987820	PLATE,MOUNTING...................... UOC:BF9	4

END OF FIGURE
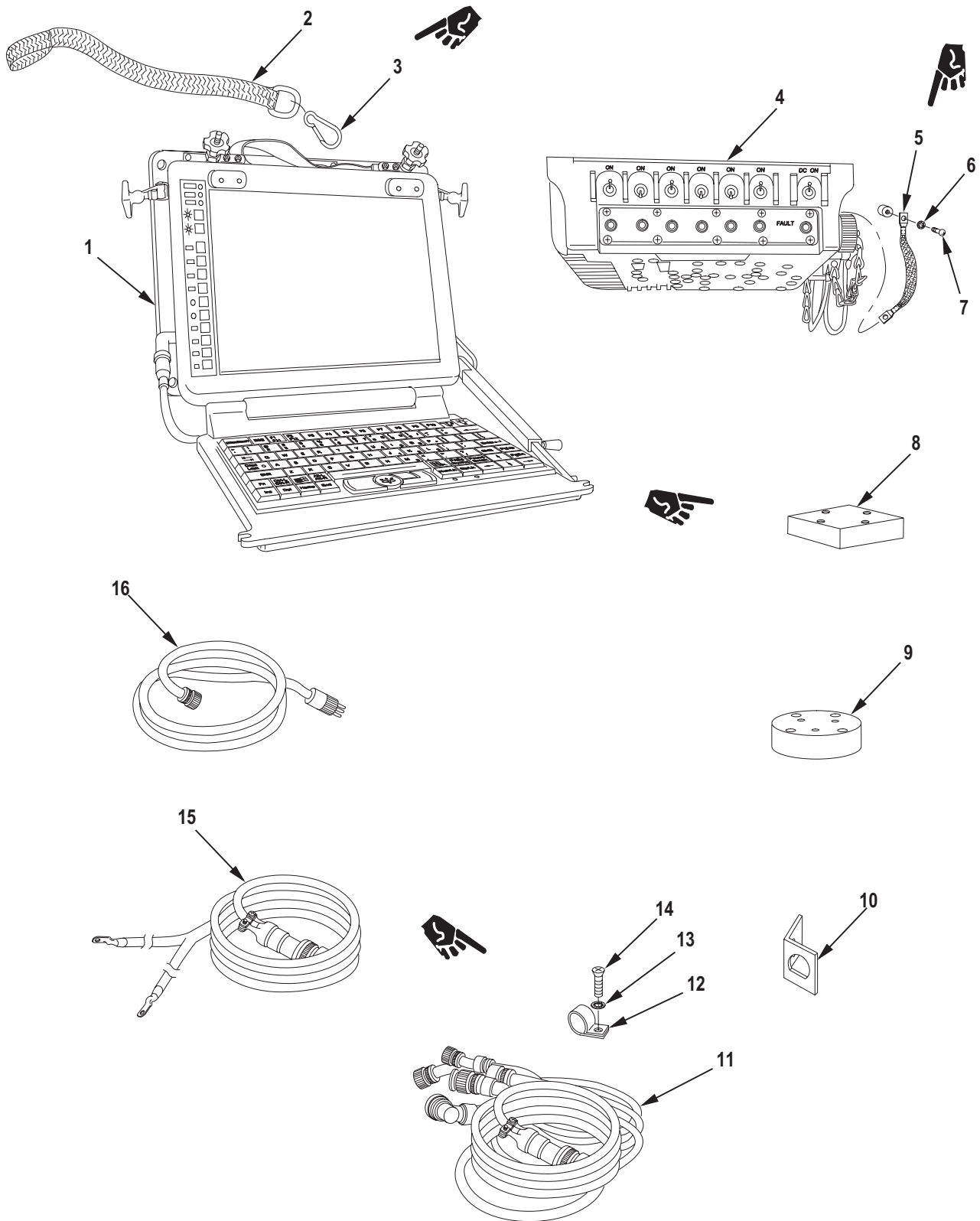
Figure C-2. M31 Mortar Ballistic Computer System, M1064, 12992851.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODES(UOC)	QTY

GROUP 01

FIG.C-2 COMPUTER SYSTEM, MORTAR
BALLISTIC,M31,M1064 P/N 12992851

1	PAODD	1220014856549	19200	12992843	COMPUTER,MORTAR BAL LISTIC,M31(SEE FIG.C-3 FOR ASSEMBLY BREAKDOWN)..... UOC:BH8	1
2	PAOZZ	5340015126425	19200	12987809	LANYARD,SAFETY...................... UOC:BH8	1
3	PAOZZ	1220014854436	19200	12987815	CLAMP ASSEMBLY MOUN T.............. UOC:BH8	1
4	PAODD	6150014856552	19200	12992895	ASSEMBLY,POWER DIST RIBUTION (SEE FIG.C-4 FOR ASSEMBLY BREAKDOWN)..... UOC:BH8	1
5	PAOZZ	6150015124826	19200	12992760	STRAP,GROUNDING..................... UOC:BH8	1
6	PAOZZ	5310005765752	96906	MS35333-39	WASHER,INT-TOOTH.................... UOC:BH8	1
7	PAOZZ	5305009846211	96906	MS35206-264	SCREW,MACHINE,PANHD................. UOC:BH8	1
8	PAOZZ	5340014853463	19200	12987812	PLATE,MOUNTING(SEE FIG.C-6 FOR ASSEMBLY BREAKDOWN)................. UOC:BH8	1
9	PAOZZ	5340014853473	19200	12987813	PLATE,MOUNTING(SEE FIG.C-7 FOR ASSEMBLY BREAKDOWN)................. UOC:BH8	1
10	PAOZZ	5340014853468	19200	12992815	BRACKET,ANGLE (SEE FIG.C-8 FOR ASSEMBLY BREAKDOWN)................. UOC:BH8	1
11	PAOZZ	5995014853466	19200	12992871	CABLE ASSEMBLY POWE R (3W17)....... UOC:BH8	1
12	PAOZZ	5340000881254	80205	MS21333-104	CLAMP,LOOP.......................... UOC:BH8	4
13	PAOZZ	5310005501130	96906	MS35333-40	WASHER,LOCK......................... UOC:BH8	4
14	PAOZZ	5305009881724	96906	MS35206-280	SCREW,MACHINE....................... UOC:BH8	4
15	PAOZZ	5995014853469	19200	12992867	CABLE ASSEMBLY,SPEC IAL(3W6)....... UOC:BH8	1
16	PAOZZ	5995014853467	19200	12992872	CABLE ASSEMBLY(34W4).............. UOC:BH8	1

END OF FIGURE

M577 Installation

M1064 Installation

***NOTE**
PART OF IDENTICALLY
NUMBERED ITEM.

NOTE
ITEMS MUST BE
ORDERED SEPARATELY.
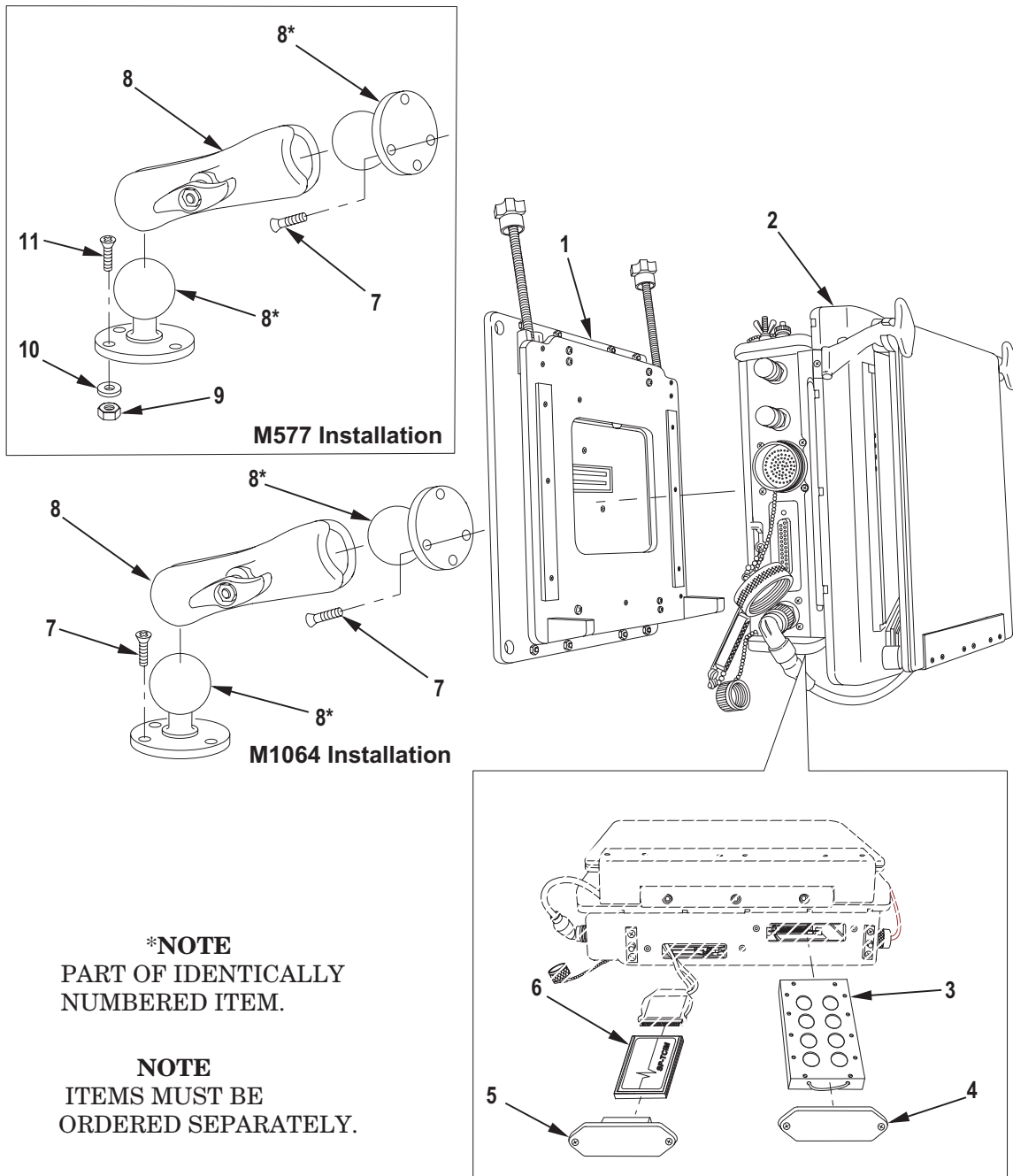
Figure C-3. M31 Mortar Ballistic Computer 12992843.

```
 (1)  (2)   (3)        (4)       (5)                    (6)                        (7)
ITEM  SMR                       PART
 NO   CODE  NSN       CAGEC     NUMBER   DESCRIPTION AND USABLE ON CODES(UOC) QTY
```

GROUP 02

FIG.C-3 COMPUTER, MORTAR BALLISTIC,
M31 P/N 12992843

```
 1 PAOZZ 5342014853461 19200 12992839    MOUNT,RESILIENT,WEA  PON............   1
                                         UOC:BF9,BH8
 2 XAODD 1220014841740 19200 12992843    COMPUTER,BALLISTIC  M31,             1
                                         COMMANDER'S INTERFACE...............
                                         UOC:BF9,BH8
 3 PAFDD 5998015053672 19200 12992772    .CIRCUIT CARD ASSEMB  LY, HARD DRIVE  1
                                         UOC:BF9,BH8
 4 PAOZZ 5340015047763 19200 12992773    .COVER,ACCESS HD....................   1
                                         UOC:BF9,BH8
 5 PAOZZ 5340015047764 19200 12992774    .COVER, ACCESS, TCIM...............   1
                                         UOC:BF9,BH8
 6 PAFDD 5998015052932 19200 12992771    .CIRCUIT CARD ASSEMB  LY,TCIM.......   1
                                         UOC:BF9,BH8
 7 PAOZZ 5305009887794 96906 MS24671-30  SCREW,CAPHEAD.......................   9
                                         UOC:BH8
 8 PAOZZ 1220014856556 19200 12992837    CLAMP,BALL ASSEMBLY.................   1
                                         UOC:BF9,BH8
 9 PAOZZ 5310009291807 81349 M45913/1-4CS3  NUT,SELF-LOCK.......................   3
                                         UOC:BF9,BH8
10 PAOZZ 5310005825677 80205 MS15795-180 WASHER,FLAT.........................   3
                                         UOC:BF9,BH8
11 PAOZZ 5305007194995 96906 MS51959-87  SCREW,MACHINE.......................   3
                                         UOC:BF9
```

END OF FIGURE
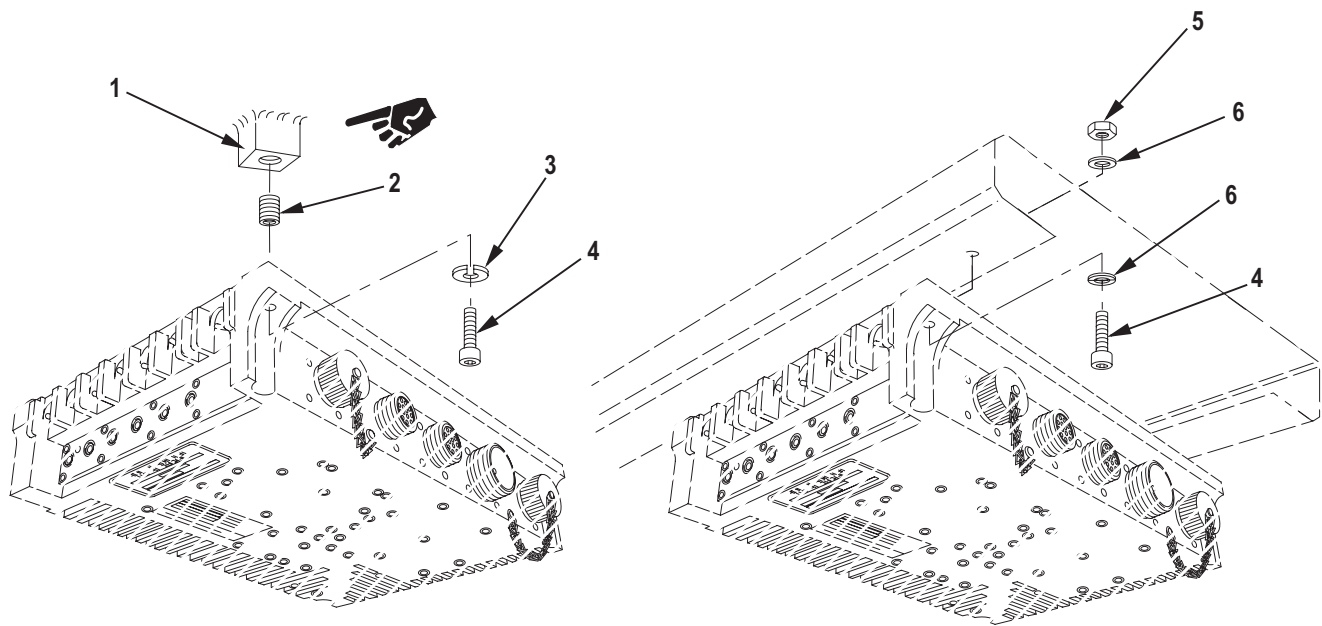
M1064
                              M577

Figure C-4. Power Distribution Assembly 12992895.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODES(UOC)	QTY

GROUP 03

FIG.C-4 POWER DISTRIBUTION ASSEMBLY
P/N 12992895

1	PAFFZ	5365014853465	19200	12987811	PLATE,SPACER........................ UOC:BH8	4
2	PAOZZ	5325002904521	96906	MS122122	INSERT,SCREW STANDO FF............. UOC:BH8	4
3	PAOZZ	5310009746623	96906	MS35338-140	WASHER,LOCK........................ UOC:BH8	4
4	PAOZZ	5305012861755	96906	NAS1352-C5-24	SCREW,CAP.......................... UOC:BH8	8
5	PAOZZ	5310002416606	96906	MS17830-5C	NUT,SELF-LOCKING................... UOC:BF9	4
6	PAOZZ	5310006255756	80205	MS15795-812	WASHER,FLAT........................ UOC:BF9	8

END OF FIGURE
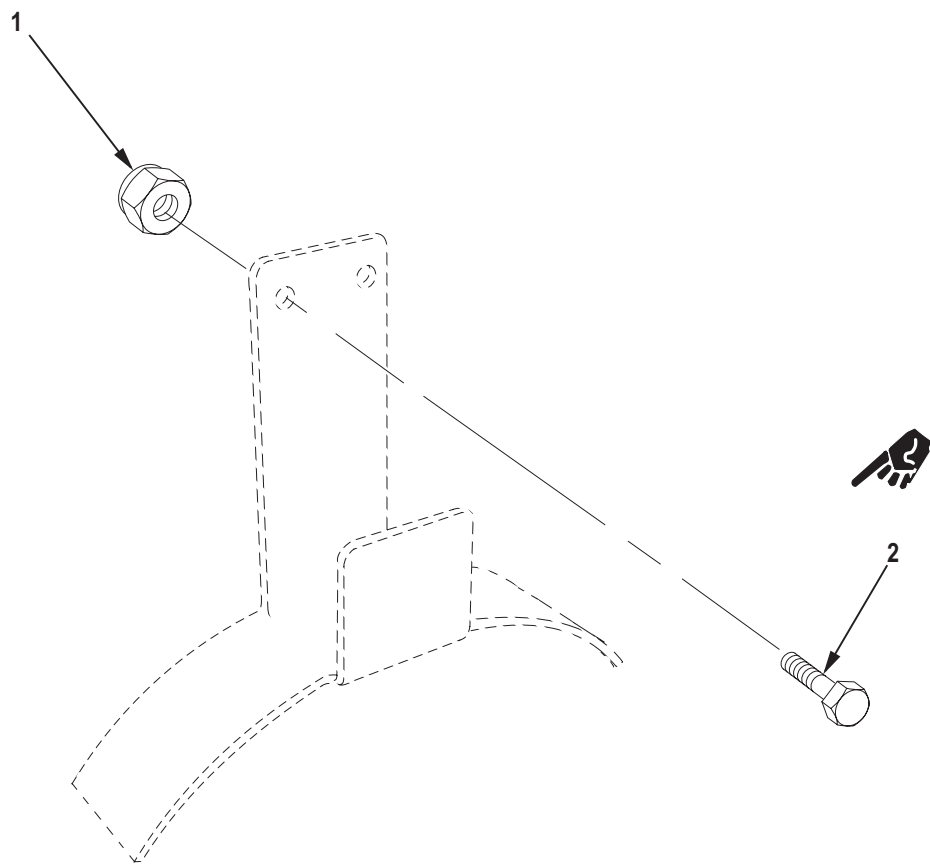
Figure C-5. Cable Hanger 12992809.

```
 (1)  (2)   (3)        (4)      (5)                    (6)                    (7)
ITEM  SMR                      PART
 NO   CODE   NSN       CAGEC   NUMBER    DESCRIPTION AND USABLE ON CODES(UOC) QTY

                                         GROUP 04

                                         FIG.C-5 CABLE HANGER P/N 12992809

  1 PAOZZ 5310009291807 81349 M45913/1-4CS3   NUT,SELF-LOCKING.....................  2
                                         UOC:BF9,BH8
  2 PAOZZ 5305007024523 80205 MS35307-306     SCREW,CAP............................  2
                                         UOC:BF9

                              END OF FIGURE
```
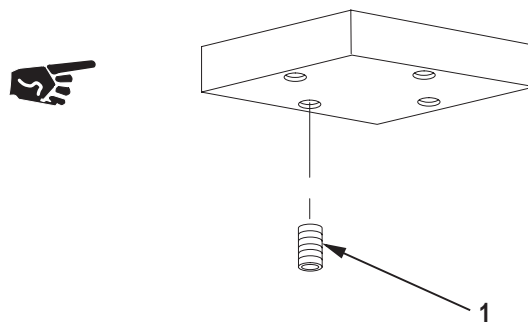
Figure C-6. Top Mounting Block 12987812.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM	SMR			PART		
NO	CODE	NSN	CAGEC	NUMBER	DESCRIPTION AND USABLE ON CODES(UOC)	QTY

GROUP 05

FIG.C-6 TOP MOUNTING BLOCK
P/N 12987812

| 1 | PAOZZ | 5325002904521 | 96906 | MS122122 | INSERT,SCREW HANDOF F.............. | 4 |
| | | | | | UOC:BH8 | |

END OF FIGURE
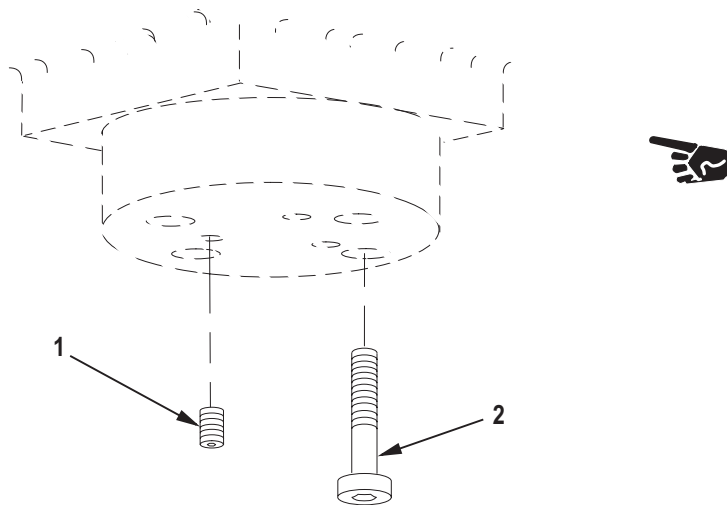
Figure C-7. Bottom Mounting Block 12987813.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM	SMR			PART		
NO	CODE	NSN	CAGEC	NUMBER	DESCRIPTION AND USABLE ON CODES(UOC)	QTY

GROUP 06

FIG.C-7 BOTTOM MOUNTING BLOCK
P/N 12987813

1	PAOZZ	5325010306854	96906	MS122121	INSERT,THREAD.......................	3
					UOC:BH8	
2	PAOZZ	5305012861755	96906	NAS1352-C5-24	SCREW,CAP...........................	4
					UOC:BH8	

END OF FIGURE
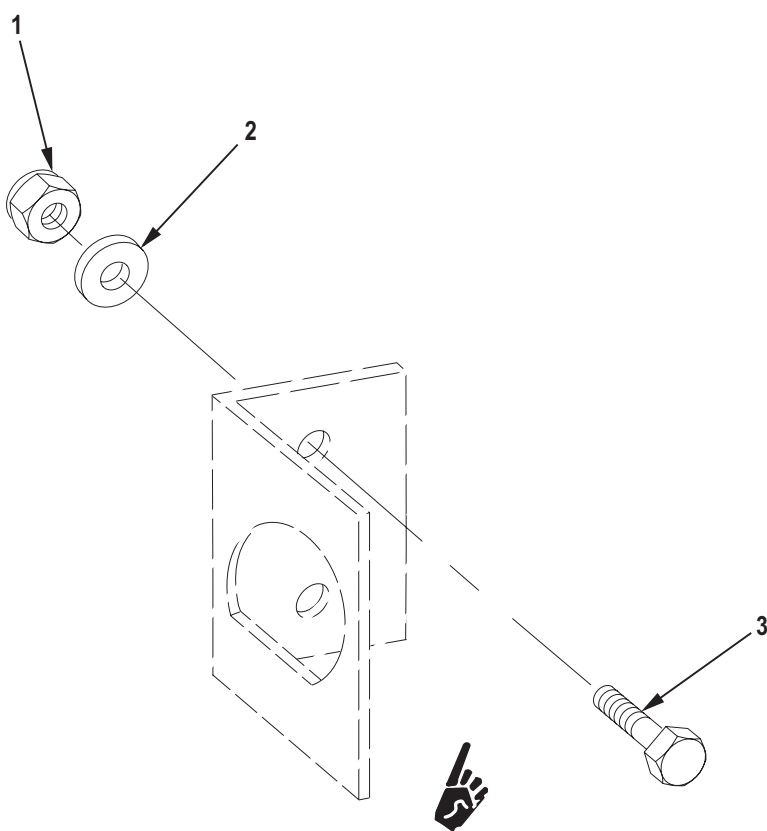
Figure C-8. Support Bracket 12992815.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODES(UOC)	QTY

GROUP 07

FIG.C-8 SUPPORT BRACKET P/N 12992815

1	PAOZZ	5310009291807	81349	M45913/1-4CS3	SCREW, SELF-LOCK.....................	2
					UOC:BF9,BH8	
2	PAOZZ	5310005825677	80205	MS15795-180	WASHER,FLAT.........................	2
					UOC:BF9,BH8	
3	PAOZZ	5305000213616	96906	MS35307-305	SCREW,CAP...........................	2
					UOC:BH8	

END OF FIGURE

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5340-00-088-1254	C-2	12			
5310-00-241-6606	C-4	5			
5325-00-290-4521	C-4	2			
	C-6	1			
5310-00-550-1130	C-1	4			
	C-2	13			
5310-00-576-5752	C-2	6			
5310-00-625-5756	C-4	6			
5305-00-702-4523	C-5	2			
5305-00-719-4995	C-3	11			
5310-00-929-1807	C-3	9			
	C-5	1			
	C-8	1			
5310-00-974-6623	C-4	3			
5305-00-984-6211	C-2	7			
5305-00-988-1724	C-1	5			
	C-2	14			
5305-00-988-7794	C-3	7			
5325-01-030-6854	C-7	1			
5342-01-485-3461	C-3	1			
5340-01-485-3463	C-2	8			
5365-01-485-3465	C-4	1			
5995-01-485-3466	C-2	11			
5995-01-485-3467	C-1	10			
	C-2	16			
5340-01-485-3468	C-2	10			
5995-01-485-3469	C-2	15			
5975-01-485-3470	C-1	6			
5995-01-485-3471	C-1	9			
5995-01-485-3472	C-1	7			
5340-01-485-3473	C-2	9			
5995-01-485-3474	C-1	8			
5340-01-485-3475	C-1	11			
1220-01-485-4436	C-2	3			
1220-01-485-6549	C-1	1			
	C-2	1			
6150-01-485-6552	C-1	2			
	C-2	4			
1220-01-485-6556	C-3	8			
5340-01-504-7763	C-3	4			
5340-01-504-7764	C-3	5			
5998-01-505-2932	C-3	6			
5998-01-505-3672	C-3	3			
6150-01-512-4826	C-1	3			
	C-2	5			
5340-01-512-6425	C-2	2			

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
96906	MS122121	5325-01-030-6854	C-7	1
96906	MS122122	5325-00-290-4521	C-4	2
			C-6	1
80205	MS15795-180		C-3	10
			C-8	2
80205	MS15795-812	5310-00-625-5756	C-4	6
96906	MS17830-5C	5310-00-241-6606	C-4	5
80205	MS21333-104	5340-00-088-1254	C-2	12
96906	MS24671-30	5305-00-988-7794	C-3	7
96906	MS35206-264	5305-00-984-6211	C-2	7
96906	MS35206-280	5305-00-988-1724	C-1	5
			C-2	14
96906	MS35307-305		C-8	3
80205	MS35307-306	5305-00-702-4523	C-5	2
96906	MS35333-39	5310-00-576-5752	C-2	6
96906	MS35333-40	5310-00-550-1130	C-1	4
			C-2	13
96906	MS35338-140	5310-00-974-6623	C-4	3
96906	MS51959-87	5305-00-719-4995	C-3	11
81349	M45913/1-4CS3	5310-00-929-1807	C-3	9
			C-5	1
			C-8	1
96906	NAS1352-C5-24		C-4	4
			C-7	2
19200	12987809	5340-01-512-6425	C-2	2
19200	12987811	5365-01-485-3465	C-4	1
19200	12987812	5340-01-485-3463	C-2	8
19200	12987813	5340-01-485-3473	C-2	9
19200	12987815	1220-01-485-4436	C-2	3
19200	12987820	5340-01-485-3475	C-1	11
19200	12992760	6150-01-512-4826	C-1	3
			C-2	5
19200	12992771	5998-01-505-2932	C-3	6
19200	12992772	5998-01-505-3672	C-3	3
19200	12992773	5340-01-504-7763	C-3	4
19200	12992774	5340-01-504-7764	C-3	5
19200	12992809	5975-01-485-3470	C-1	6
19200	12992815	5340-01-485-3468	C-2	10
19200	12992837	1220-01-485-6556	C-3	8
19200	12992839	5342-01-485-3461	C-3	1
19200	12992843	1220-01-485-6549	C-1	1
			C-2	1
			C-3	2
19200	12992860	5995-01-485-3474	C-1	8
19200	12992861	5995-01-485-3472	C-1	7
19200	12992865	5995-01-485-3471	C-1	9
19200	12992867	5995-01-485-3469	C-2	15
19200	12992871	5995-01-485-3466	C-2	11
19200	12992872	5995-01-485-3467	C-1	10
			C-2	16
19200	12992895	6150-01-485-6552	C-1	2

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
19200	12992895	6150-01-485-6552	C-2	4

APPENDIX D
COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists components of the end item and basic issue items for the Mortar Ballistic Computer (MBC) to help you inventory the items required for safe and efficient operation of the equipment.

D-2. GENERAL.

The Components of End Item (COEI) and Basic Issue Items (BII) Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only and is not authority to requisition replacements. These items are part of the Mortar Ballistic Computer but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These essential items are required to place the Mortar Ballistic Computer in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with equipment during operation and whenever it is transferred between property accounts. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item. The illustrations will assist you with hard to identify items.

D-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns in the tabular listings:

a. Column (1) - Illustration Number (Illus Number). Indicates the number of the illustration in which the item is shown.

b. Column (2) - National Stock Number. Indicates the National stock number assigned to the item that will be used for requisitioning purposes.

c. Column (3) - Description, CAGEC, and Part Number. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGEC (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/ maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea., pr).

e. Column (5) - Quantity Required (Qty Rqr). Indicates the quantity required.
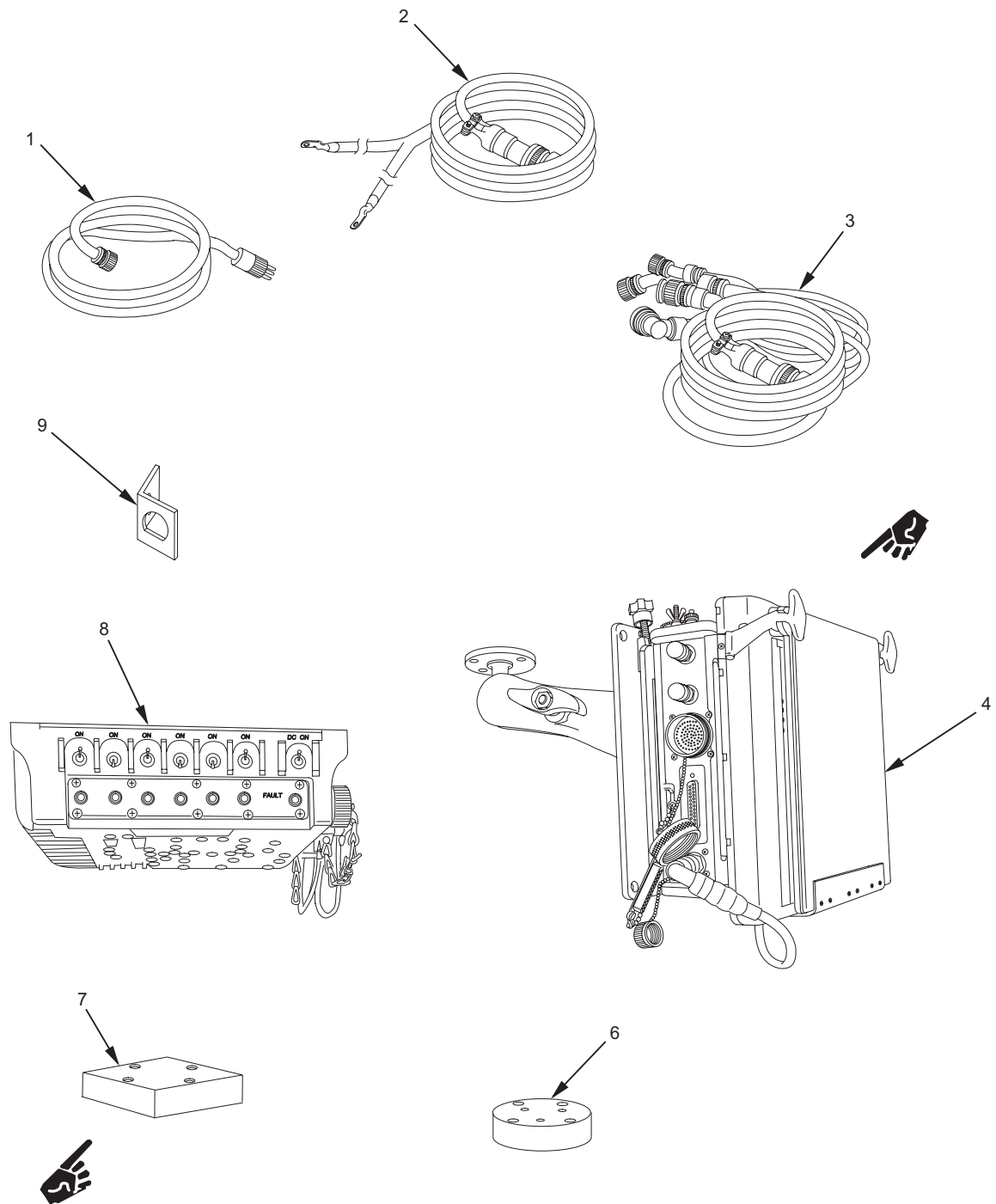
Section II. COMPONENTS OF END ITEM
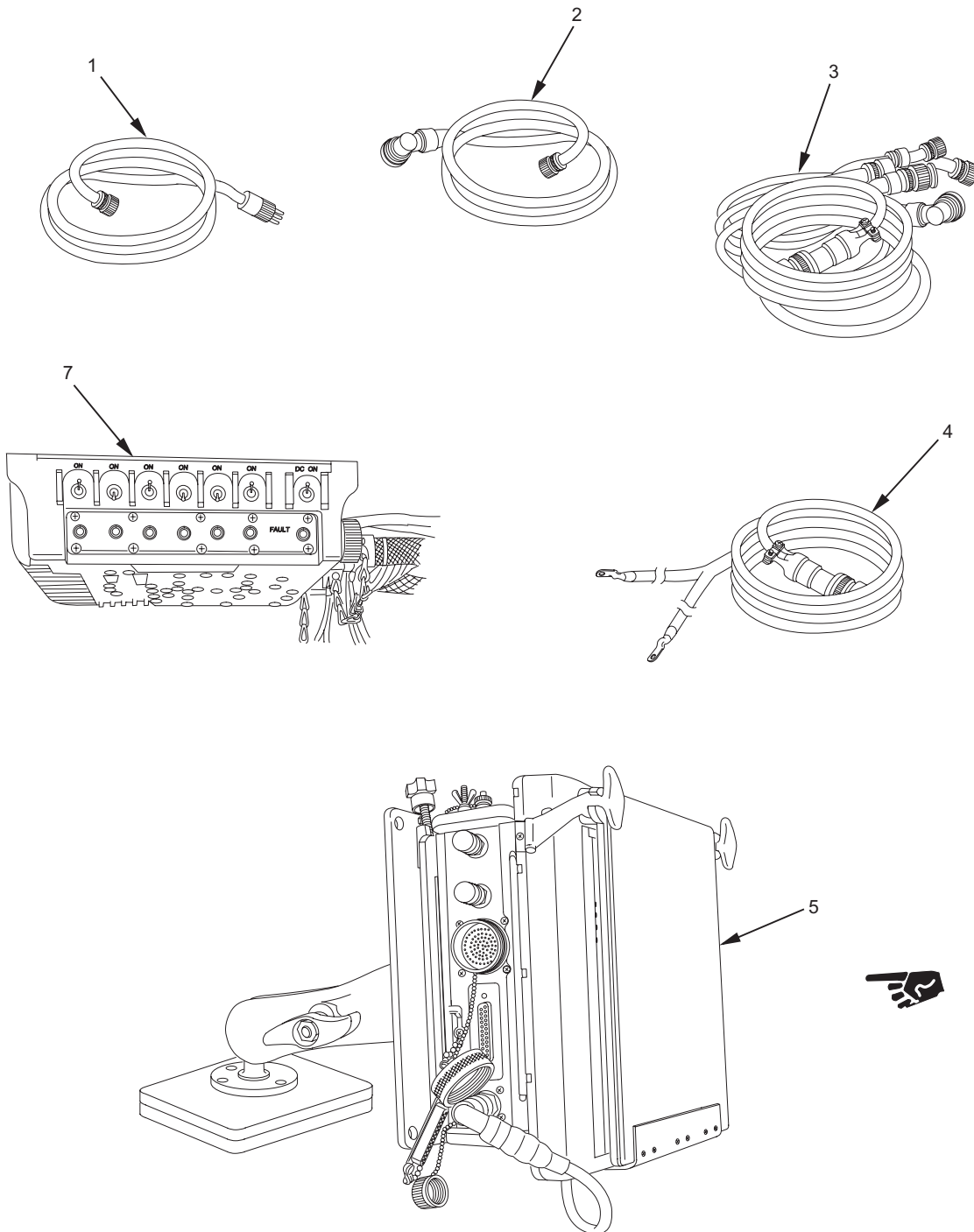
M577

Table 1. Components of End Item for M577 Vehicle.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) U/M	(5) QTY RQR
1	5995-01-485-3467	CABLE, POWER, VAC (34W4) (19200) 12992872	EA	1
2	5995-01-485-3471	CABLE, SPECIAL PURPOSE (34W2) (19200) 12992865	EA	1
3	5995-01-485-3472	CABLE, SPECIAL PURPOSE (POWER AND COMMUNICATION) (4W7) (19200) 12992861	EA	1
4	5995-01-485-3474	CABLE, SPECIAL PURPOSE (VEHICLE BATTERY) (4W6) (19200) 12992860	EA	1
5	1220-01-485-6549	COMMANDER'S INTERFACE (CI), MBC, XM31 (19200) 12992843	EA	2
6		DELETED		
7	6150-01-485-6552	POWER DISTRIBUTION ASSEMBLY (19200) 12992895	EA	1

Section II. COMPONENTS OF END ITEM (cont)

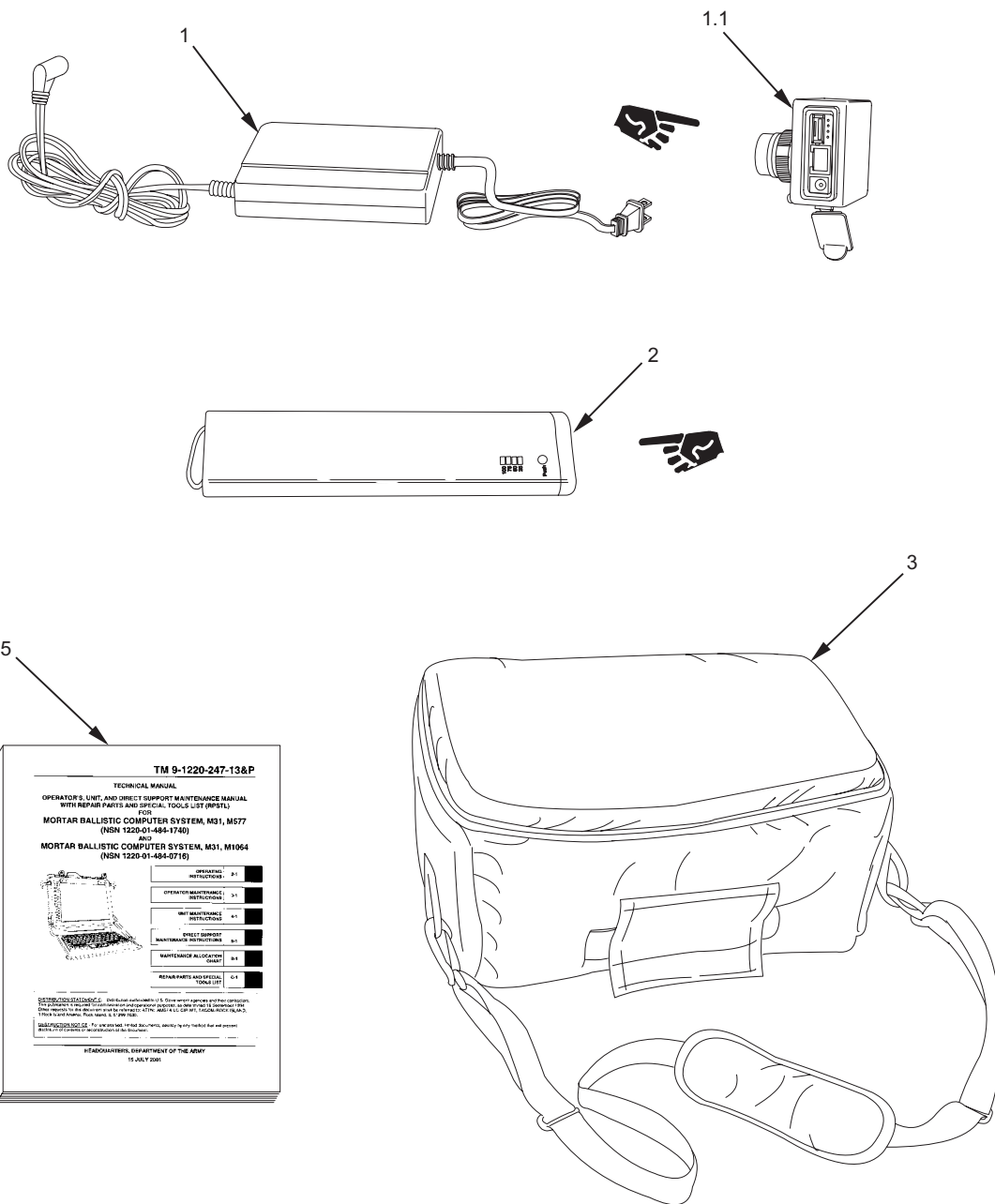**M1064**

Table 2. Components of End Item for M1064 Carrier.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) U/M	(5) QTY RQR	
1	5995-01-485-3467	CABLE, POWER, VAC (34W4) (19200) 12992872	EA	1	
2	5005-01-485-3469	CABLE, SPECIAL PURPOSE (VEHICLE BATTERY) (3W6) (19200) 12992867	EA	1	
3	5995-01-485-3466	CABLE, SPECIAL PURPOSE (POWER AND COMMUNICATION) (3W17) (19200) 12992871	EA	1	
4	1220-01-485-6549	COMMANDER'S INTERFACE (CI), MBC, XM31 (19200) 12992843	EA	1	▌
5		DELETED			▌
6	5340-01-485-3473	MOUNTING BLOCK, BOTTOM (19200) 12987813	EA	1	
7	5340-01-485-3463	MOUNTING BLOCK, TOP (19200) 12987812	EA	1	
8	6150-01-485-6552	POWER DISTRIBUTION ASSEMBLY (19200) 12992895	EA	1	
9	5340-01-485-3468	SUPPORT BRACKET (19200) 12992815	EA	1	

Section III. BASIC ISSUE ITEMS

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) U/M	(5) QTY RQR	
1	5995-01-793-3401	AC/DC ADAPTER (19200) 12992896	EA	1	
1.1	4940-01-504-7762	ADAPTER, CABLE BREAKOUT (19200) 12992813	EA	1	▌
2	6135-01-793-3481	BATTERY, RECHARGEABLE (19200) 12992897	EA	2	
3	5840-01-793-3423	CARRYING CASE (19200) 12992817	EA	2	
4		DELETED			▌
5		TECHNICAL MANUAL, TM 9-1220-247-13&P	EA	1	

APPENDIX E
ADDITIONAL AUTHORIZATION LIST

There are no AAL items authorized for the M31 Mortar Ballistic Computer.

APPENDIX F
EXPENDABLE AND DURABLE ITEMS LIST

Section I. INTRODUCTION

F-1. SCOPE.

This appendix lists expendable supplies and material you will need to operate and maintain Mortar Ballistic Computer (MBC). These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

F-2. EXPLANATION OF COLUMNS.

An explanation of columns is provided below.

    a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use sealing compound (item 10, Appendix F).").

    b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item:

        C   Operator or crew
        O   Unit Maintenance
        F   Direct Support Maintenance
        H   Direct Support Maintenance
        D   Depot Maintenance

    c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item. Use it to request or requisition the item.

    d. Column (4) - Item Name, Description, CAGEC, and Part Number. Indicates the Federal item name and, if required, the description to identify the item. The last line for each item indicates the Part Number followed by the Commercial and Government Entity Code (CAGEC) in parentheses, if applicable.

    e. Column (5) - Unit of Measure. Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.
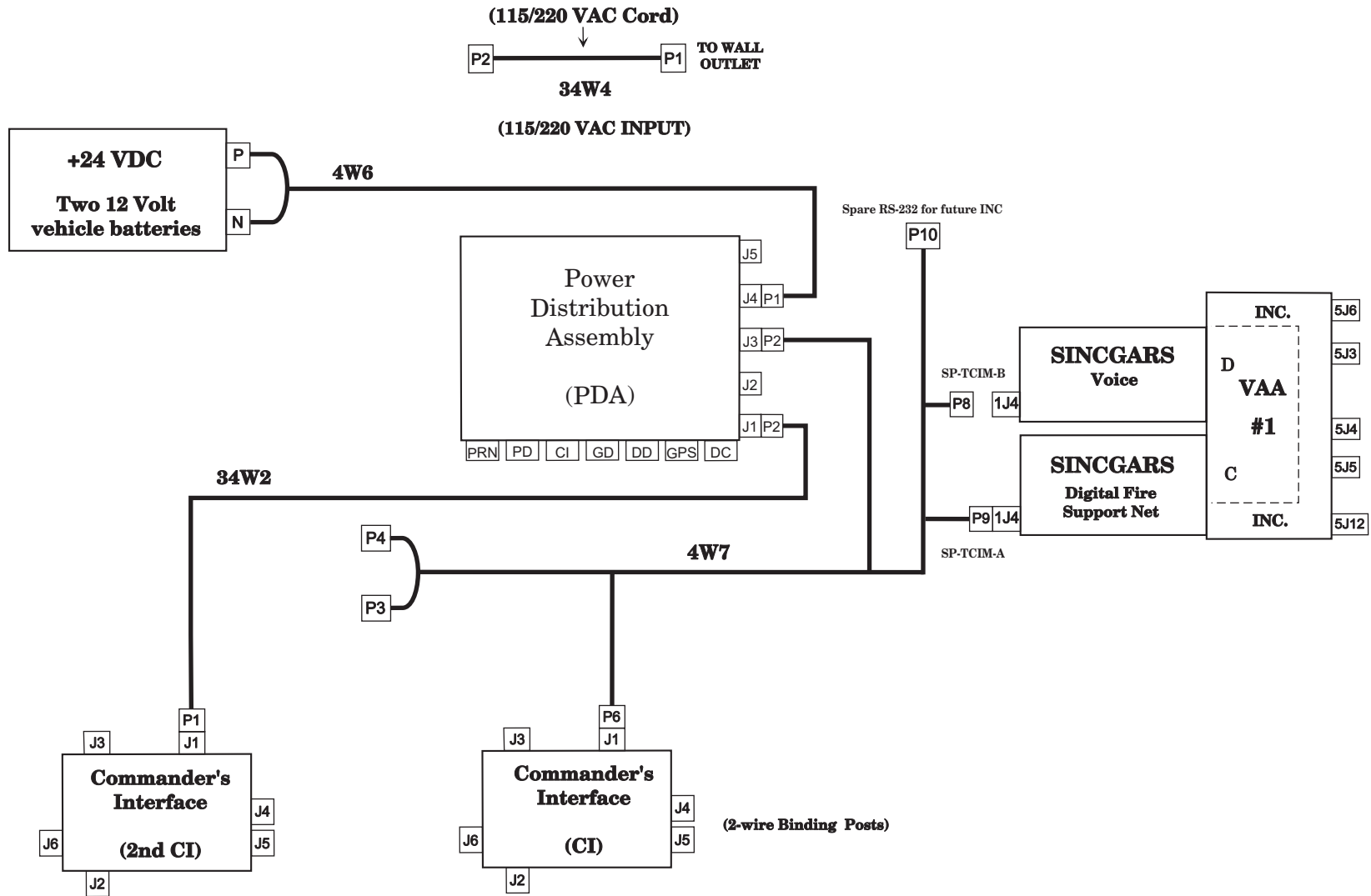
Table F-1. Expendable and Durable Items.

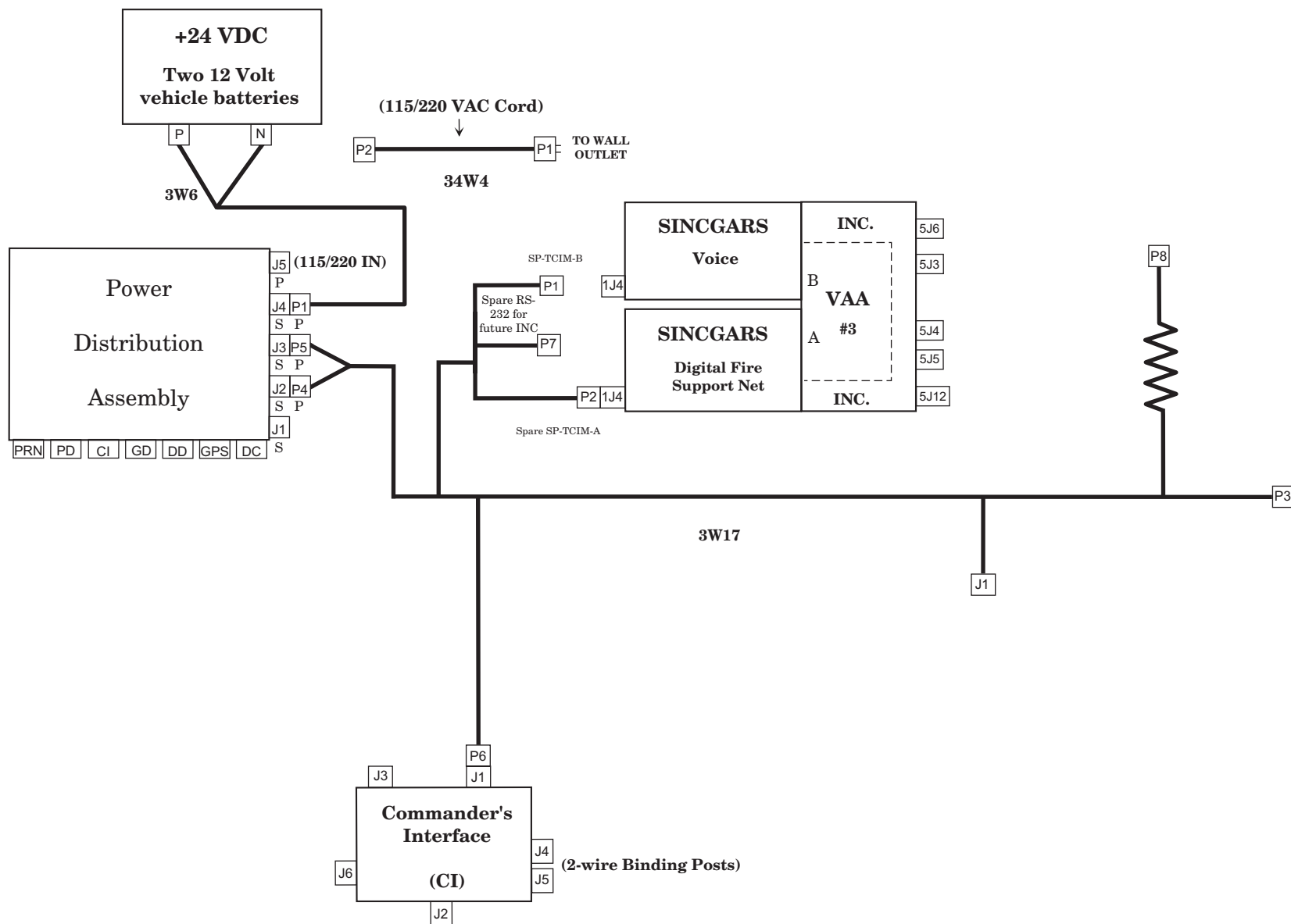| (1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, AND PART NUMBER	(5) UNIT OF MEASURE
1	O	8040-00-290-4301	ADHESIVE (55974) Q76072-3	QT
1.1	F	8030-01-347-0964	ADHESIVE, SILIPRENE 11 oz (00333) M6325	TU
2	C	8020-00-201-1870	BRUSH, ARTIST (81348) H-B-241	EA
3	O	5340-00-057-3043	CLAMP, LOOP 1/2 in. (96906) MS21331-112	EA
3.1	O		CLAMP, LOOP (96906) MS21333-104	EA
4	O	8030-01-054-3968	COMPOUND, THREAD-LOCKING (05972) 222-21	BX
5	O	5325-00-174-9341	GROMMET, NONMETALLIC (96906) MS35489-52	RO
6			DELETED	
7	C	9150-00-231-2361	LUBRICATING OIL, GENERAL PURPOSE (GPL) (81349) MIL-L-3150	QT
8	C	6640-00-285-4694	PAPER, LENS (81348) NNN-P-40 100 sheet package	EA
9	C	7920-00-205-1711	RAG, WIPING (64067) 7920-00-205-1711 50 lb bundle	LB
10	O	8030-00-081-2333	SEALING COMPOUND (05972) 08421	BX
11	C	6850-00-294-0860	SILICONE COMPOUND (03CA3) PST-511	TU
12	O	5975-00-345-8055	STRAP, CABLE (19207) 10905840	RO
13	O	5975-01-431-3403	STRAP, MOUNTING .300 W x 15.5 L (black) (06383) SSC4H-S25-D0	RO
14	O	5975-01-480-2229	STRAP, TIE .375 W x 14.5 L (black) (06383) PLT3H-TL100	BD
15	F	7510-01-508-8235	TAPE, NON-CONDUCTIVE ELECTRICAL (66442) 6235 1 in 36 yd	RO

APPENDIX G
BLOCK DIAGRAM FOR CABLE INSTALLATION

G-1. INTRODUCTION.

This appendix provides wiring schematics for the installation of cables for the Mortar Ballistic Computer (MBC) system. Schematics are shown for the M577 Vehicle and the M1064 Carrier.

(115/220 VAC Cord)

P2 ———————— P1 TO WALL OUTLET

34W4

(115/220 VAC INPUT)

+24 VDC	P
Two 12 Volt vehicle batteries	N

4W6

Spare RS-232 for future INC

P10

Power Distribution Assembly (PDA)	J5	
	J4	P1
	J3	P2
	J2	
	J1	P2

PRN PD CI GD DD GPS DC

SP-TCIM-B

P8   1J4

SINCGARS Voice

SINCGARS Digital Fire Support Net

P9 1J4

SP-TCIM-A

	INC.	5J6
D		5J3
	VAA #1	
C		5J4
		5J5
	INC.	5J12

34W2

P4

P3

4W7

P1
J1

J3	Commander's Interface	J4
	(2nd CI)	J5
J6		
	J2	

P6
J1

J3	Commander's Interface	J4
	(CI)	J5
J6		
	J2	

(2-wire Binding Posts)

MBC M577 FDC Cable Interconnection Diagram

+24 VDC

Two 12 Volt
vehicle batteries

P   N

3W6

(115/220 VAC Cord)

P2   P1   TO WALL
OUTLET

34W4

Power

Distribution

Assembly

J5 (115/220 IN)
P
J4 P1
S P
J3 P5
S P
J2 P4
S P
J1
S

PRN PD CI GD DD GPS DC

SP-TCIM-B

P1

Spare RS-
232 for
future INC

P7

P2 1J4

Spare SP-TCIM-A

SINCGARS

Voice

1J4

SINCGARS

Digital Fire
Support Net

INC.

B

VAA

#3

A

INC.

5J6

5J3

5J4

5J5

5J12

P8

P3

3W17

J1

P6
J1

J3

Commander's
Interface

(CI)

J4

J5   (2-wire Binding Posts)

J6

J2

MBC M1064 Cable Interconnection Diagram

APPENDIX H
RADIO SETUP PROCEDURES

H-1. INTRODUCTION.

This appendix provides information for the setup of the single-channel ground and airborne radio system (SINCGARS) radios to allow digital communication between the M577 Fire Direction Center and the M1064 Carrier. Refer to TM 11-5820-890-10-7 for further information.

H-2. RADIO SETUP.

MBC Communications Setup

NOTE

Due to the similarity of the M577 and M1064 configurations, only the communication setup procedures for the M577 are described.

1. Connect M31 Mortar Ballistic Computer (MBC) to power distribution assembly (PDA) — M577.

    a. Primary MBC: Connect P2 connector of 4W7 cable to J3 port on PDA. Connect P6 connector of 4W7 cable to J1 connector on primary computer.

    b. Secondary MBC: Connect P2 connector of 34W2 cable to J1 port on PDA. Connect P1 connector of 34W2 cable to J1 connector on secondary computer.

2. Connect P8 connector of 4W7 cable to SINCGARS Channel A (Top) R/T #2.

3. Connect P9 connector of 4W7 cable to SINCGARS Channel B (Bottom) R/T #3.

SINCGARS RT-1523E (ASIP) Setup for M577 MBC

NOTE

Radio setup procedures may vary according to tactical situation and/or mission requirements. For assistance, refer to unit standard operating procedures (SOP), SINCGARS technical manuals, and communication specialist.

Before starting vehicle, ensure that SINCGARS radio is set in STANDBY mode.

1. Turn on VAA AM7239E.

2. Turn on SINCGARS radio by turning Control knob to TEST.

3. Turn radio to LD.

4. Press MENU/CLR button. This will guide operator through the settings.

5. Set Volume preference (0 - 9); press MENU/CLR button.

6. Choose Power preference (lo, med, hi, PA (power amp)); press MENU/CLR button.

7. Set Channel to MAN (channels 1 - 6); press MENU/CLR button.

H-2. RADIO SETUP (cont).

SINCGARS RT-1523E (ASIP) Setup for M577 MBC (cont)

8.   Set MODE to SC (Single Channel); press MENU/CLR button.

9.   Set COMSEC to PT (Plain Text); press MENU/CLR button.

10.   Switch FCTN knob to LD position.

11.   Set the desired frequency:

   a.   Select FREQ key on keypad.

   b.   Press CLR.

   c.   Enter frequency and press STO, on each radio. Ensure that frequency is the same for both radios.

12.   Set the DATA Rate:

   a.   Select DATA key (DATA is key #4) on keypad.

   b.   Press CHG key (CHG is key #7) until proper Data Rate (1200 or 600) is displayed.

   c.   Deleted.

   d.   Ensure that Data Rate is the same for both radios.

13.   Turn FCTN knob to ON position.

14.   The radio should now be ready for digital communications.

15.   To begin mission, see paragraph 2-10 for initialization of MBC.

SINCGARS RT-1523 A/B/C/D Setup for M577 FDC

NOTE

Radio setup procedures may vary according to tactical situation and/or mission requirements. For assistance, refer to unit standard operating procedures (SOP), SINCGARS technical manuals, and communication specialist.

Before starting vehicle, ensure that SINCGARS radio is set in STANDBY mode.

1.   Turn on VAA AM7239E.

2.   Turn on SINCGARS radio with the FCTN knob.

3.   Set Channel knob to MAN (channels 1 - 6).

4.   Set POWER knob to M (medium), L (low), or PA (power amp), depending on the radio system.

5.   Set MODE knob to SC (Single Channel).

6.   Set COMSEC knob to PT (Plain Text).

7.   Set FCTN knob to LD position.

8.   Set the desired frequency:

   a.   Select FREQ key on keypad.

   b.   Press CLR.

   c.   Enter frequency and press STO, on each radio. Ensure that frequency is the same for both radios.

9.   Set the DATA Rate:

   a.   Select DATA key (DATA is key #4) on keypad.

   b.   Press CHG key (CHG is key #7) until proper Data Rate (1200 or 600) is displayed.

   c.   Deleted.

   d.   Ensure that Data Rate is the same for both radios.

10. Set radio to ON position.

11. The radio should now be ready for digital communications.

12. To begin mission, see paragraph 2-10 for initialization of MBC.

NOTE

   If SINCGARS radios are inoperable, system can be configured for wire operations.

Forward Observer System Software (FOSS) Communications Setup

NOTE

   In order to communicate with the forward observer, forward observer system software (FOSS) will be setup as described.

1.   Press the "J" key (FED STATUS). Then press "B"; the NET STATUS screen will be displayed (Note: Data values will not necessarily match those shown.).

NET STATUS

CONNECTION	SINCGARS RADIO (or 2 WIRE, if desired)
BLOCK	SINGLE
PREAMBLE	1.4
RATE	1200
DELAY	1.0
	00:00:00

H-2. RADIO SETUP (cont).

Forward Observer System Software (FOSS) Communications Setup (cont)

2. Setup the Subscriber Data in the FOSS to agree with Subscriber Data in the MBC.

3. Be sure to set communications parameters on the FOSS as detailed in the Communications Setup for the MBC:

NETWORK ID	(e.g., A for Channel A);
SUBSCRIBER TYPE	FO;
DEVICE TYPE	UNKNOWN or FED;
SUBSCRIBER ID	Any 4 character set (2 alpha, 2 numeric).

Power Down Procedure (for Later Operations)

1. Set radio FCTN knob to STANDBY position.

2. Turn VAA off.

3. Ensure that all internal communications are powered off.

Power Down Procedure (Complete)

1. Set radio FCTN knob to OFF position.

2. Turn VAA off.

3. Ensure that all internal communications are powered off.

APPENDIX I
OPERATOR ALERT AND ERROR MESSAGES

I-1. MESSAGES.

This appendix lists alert and error messages that the operator may receive while using the Mortar Ballistic Computer (MBC).

Table I-1. Operator Alert and Error Messages.

Operator Alert Message	Possible Causes	Expected Operator Action
4 NOT VALID FOR OCTANT	Operator entered "4".	Enter a valid octant number (0 to 3 and 5 to 9).
ACA OUTSIDE MAPMOD - DELETED	Defined ACA location is now located outside the MAP MOD, due to the operator entry of a new MAP MOD.	ACA location is invalid within the new MAP MOD. Operator has a choice of either not accepting the new MAP MOD, or accepting the new MAP MOD and thereby deleting the ACA.
ACA VIOLATION	Calculated fire trajectory passes through the ACA geometry.	Operator can override the ACA violation to obtain firing orders.
AIR PRESSURE MUST BE BETWEEN 0010 AND 1999	Operator entered an invalid air pressure value.	Enter a valid air pressure value between 0010 and 1999.
AIR TEMPERATURE MUST BE BETWEEN 1500 AND 3440	Operator entered an invalid air temperature value.	Enter a valid air temperature value between 1500 and 3440.
ALL FORWARD OBSERVERS DEFINED	Operator attempted to enter a 13th FO location.	Only 12 FO locations can be stored.
ALL FPF LINES ACTIVE	Operator attempted to enter a 3rd FPF line.	Only 3 FPF lines can be stored.
ALL SIGHTINGS ALREADY CONTAIN DATA	At least one active mission and all sightings contain sighting data for the MPI forward observer.	All MPI sightings have been entered. Operator can delete a sighting(s) and then enter the new sighting information.
ALTITUDE IS TOO HIGH	In the MPI SIGHTINGS screen, the calculated altitude is higher than 9999 meters.	A sighting data is used and causes an altitude calculation to be in excess of allowable altitude. This sighting is unusable.
ALTITUDE IS TOO LOW	In the MPI SIGHTING screen, the calculated altitude is lower than -400 meters.	A sighting data is used and causes an altitude calculation to be lower than the allowable altitude. This sighting is unusable.
ALTITUDE REQUIRED FOR WEAPON DATA	The operator has entered a squad location without entering the squad's altitude in the SURVEY screen.	Operator must also enter the squad's altitude.

I-1. MESSAGES (cont).

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
AN INCOMING MESSAGE HAS BEEN RECEIVED	This message alerts the operator that the FDC has received a digital message.	This is not an error.
BP - SOLUTION IS OUTSIDE MAPMOD	The fire mission is using an ILL round. The calculated Burst Point location for the ILL round is outside the current MAP MOD.	If the ILL round fuze fails to operate and the BP location causes a safety problem, then the operator must make the choice to use the current fire orders, or to calculate another fire mission.
BURST POINT OUTSIDE MAPMOD	The fire mission is using an ILL round. The calculated Burst Point location for the ILL round is outside the current MAP MOD.	If the ILL round fuze fails to operate and the BP location causes a safety problem, then the operator must make the choice to use the current fire orders, or to calculate another fire mission.
BURST PT IS OUTSIDE MAPMOD	In the RECORD MPI SIGHTINGS screen, data is entered in AZIMUTH DEVIATION for FORWARD OBSERVER 1 and FORWARD OBSERVER 2. If calculation of the burst point is outside of the map, then message: "BURST PT IS OUTSIDE MAPMOD" is displayed.	This sighting is not valid for use in the MPI calculation.
CALCULATED ALTITUDE XXXXX IS OUT OF RANGE	In the Survey Screens, the calculated altitude is greater than 9999 or less than -400.	Check entered data for errors.
CAN ONLY DELETE LAST LINE OF DATA	Operator has selected to delete a line of new MET data that is not the last line of data entered.	The last line of new MET entered is the first line that can be deleted.
CANNOT UPDATE RPXX - MANUALLY ENTERED	In the Registration Point ID Menu screen, the registration point has been manually entered, but not as a result of a Registration Mission.	Not an error.
CHARGE TOO HIGH	Auto Charge has selected the charge for this fire mission and the target range is too close for the chosen charge.	Operator should change the charge that was auto selected to a charge that is lower until a fire solution is calculated.
CHARGE TOO HIGH FOR SAFETY FAN LIMIT	Operator had entered charge restrictions for the safety fan area of operation. The charge selected for the fire mission is in excess of the maximum charge limit of the safety fan.	Ensure the maximum charge restriction is correct. Ensure maximum range of safety fan is correct.

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
CHARGE TOO LOW	Auto Charge has selected the charge for this fire mission and the target is out of range for the chosen charge.	Operator should change the charge that was auto selected to a charge that is HIGHER until a fire solution is calculated.
CHARGE TOO LOW FOR SAFETY FAN LIMIT	In the Fire Data screen with Safety Fans in effect for the section associated with the current mission, the selected charge is less than that of the minimum charge from Safety Fan screens for the section associated with the current mission and no ballistic calculation errors (including fail point and burst point outside map mod errors) exist.	Not an error. Charge selected/calculated is below the minimum charge selected for this safety fan.
COMPUTE GUN ORDERS?	This alert message is the last stage before fire orders are displayed to the operator.	Press YES to obtain the fire orders.
CROSSING LINES NOT PERMITTED	Operator has entered FLOT points that when connected form lines that cross each other.	Reenter the FLOT points with point values that avoid crossing line segments.
DAY MUST BE BETWEEN 01 AND 31	Operator entered an invalid day value.	Enter a valid day from 01 to 31.
DELETE ALL FANS FOR SECTION?	In the Safety Fans screen with the safety fan defined, the DELETE (F3) key was pressed.	Not an error. Operator action has requested that all Safety Fans be deleted for that Section.
DELETE COORDINATED FIRE LINE?	In the Coordinated Fire Line screen with the CFL defined, the DELETE (F3) key was pressed.	Not an error. Operator action has requested that the CFL be deleted.
DELETE CURRENT MET?	In the MET SELECTION MENU there are no active missions using Current Met and the DELETE (F3) key was pressed.	Not an error. Operator action has requested that the Current MET be deleted.
DELETE FINAL PROTECTIVE FIRE LINE?	The operator has pressed the DELETE (F3) key causing this alert message to be displayed.	Not an error. The operator can press "YES" to delete the FPF line.
DELETE FLOT LINE?	Operator has pressed the DELETE (F3) key in the FLOT Menu screen.	Not an error. Operator action has requested that the FLOT be deleted.

I-1. MESSAGES (cont).

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
DELETE LATERAL BOUNDARY LINE?	Operator has pressed the DELETE (F3) key in the Lateral Boundary Menu screen.	Not an error. Operator action has requested that the LB be deleted.
DELETE MESSAGE?	Operator has pressed the DELETE (F3) key in the Mortar Message Queue screen.	Not an error. Operator action has requested that the current message be deleted.
DELETE NEW MET?	While in the New Met Screen, operator has selected to delete the new MET.	Not an error. Operator action has requested that the new MET be deleted.
DELETE RESTRICTED FIRE LINE?	The operator has pressed the DELETE (F3) key causing this alert message to be displayed.	The operator can press "YES" and the Restricted Fire Line is then deleted.
DELETE ROUND?	Operator has pressed the DELETE (F3) key in the MPI E,N,A screen.	Not an error. Operation action has requested that the round be deleted.
DELETE THIS ACA?	Operator has pressed the DELETE (F3) key to delete the ACA.	Press YES to delete the select sighting.
DELETE THIS FO?	Operator has pressed the DELETE (F3) key to delete the FO.	The operator presses "YES" and the FO is deleted.
DELETE THIS KNOWN POINT?	Operator has pressed the DELETE (F3) key to delete the selected Known Point.	The operator presses "YES" and the KNOWN POINT is deleted.
DELETE THIS NO FIRE AREA?	Operator has pressed the DELETE (F3) key to delete the selected No Fire Area.	The operator presses "YES" and the NO FIRE AREA is deleted.
DELETE THIS REGISTRATION POINT?	Operator has pressed the DELETE (F3) key to delete the selected Registration Point.	The operator presses "YES" and the Registration Point is deleted.
DELETE THIS RESTRICTED FIRE AREA?	Operator has pressed the DELETE (F3) key to delete the Restricted Fire Area.	The operator presses "YES" and the Restricted Fire Area is deleted.
DELETE THIS SECTION?	Operator has pressed the DELETE (F3) key to delete the selected Section.	The operator presses "YES" and the Section is deleted.
DELETE THIS SIGHTING?	Operator has pressed the DELETE (F3) key to delete the selected Sighting.	The operator presses "YES" and the Sighting is deleted.

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
DELETE THIS SUBSCRIBER?	Operator has pressed the DELETE (F3) key to delete the selected Subscriber.	The operator presses DELETE and the Subscriber is deleted.
DELETE THIS TARGET?	Operator has pressed the DELETE (F3) key to delete the selected Target Number.	The operator presses DELETE and the Target is deleted.
DTG IN EFFECT - DELETE THIS ACA?	Operator has pressed the DELETE (F3) key to delete the ACA while the DTG is in effect.	The operator presses DELETE and the ACA is deleted.
DUPLICATE ENTRY NUMBERS NOT ALLOWED	FL TRACE Entry numbers are the same and neither entry number is greater than 12.	Enter another number that is not a duplicate.
DUPLICATE FORWARD OBSERVER CALL SIGN	Operator has entered a FO Call Sign that is exactly the same as a stored FO Call Sign.	Operator must enter a unique FO Call Sign.
DUPLICATE FORWARD OBSERVER NUMBER	Operator has entered a FO Number that is exactly the same as a stored FO Number.	Operator must enter a unique FO Number.
DUPLICATE NETWORK ID	Operator has entered a FO Network ID that is exactly the same as a stored FO Network ID.	Operator must enter a unique FO Network ID.
DUPLICATE POINTS NOT PERMITTED	Operator entered a duplicate FLOT point.	Enter a valid FLOT point that is not a duplication of other points of the FLOT.
DUPLICATE SUBSCRIBER ID	Operator has entered a Subscriber ID that is exactly the same as a stored Subscriber ID.	Operator must enter a unique Subscriber ID.
END WITHOUT UPDATING INVENTORY?	From the Ammo Inventory Confirm Estimate of Rounds Fired screen, the END key was pressed.	Operator pressed the END key without wanting to update the ammo inventory count.
ENTER REQUIRED DATA AT HIGHLIGHTED LINE	All required data was not entered in a multiple data entry field.	Enter all required data.
ENTERED ALTITUDE IS TOO HIGH	Operator entered Altitude in the REPLOT screen that is beyond the maximum.	Reenter a valid value for altitude.
ENTERED SIGHTING IS OUTSIDE MAPMOD	The MPI sighting values are outside the MAP MOD.	Recheck for correct data entry, or do not use this sighting data.
ENTRY MUST BE IN THE RANGE OF -0400 TO 9999	In the ACA screens, the entered altitude is out of range.	Reenter a valid value for altitude.
ENTRY MUST BE IN THE RANGE OF 00 TO 23	Operator entered an invalid value for hour.	Enter a valid value of 00 to 23 hours.
ENTRY MUST BE IN THE RANGE OF 00 TO 59	Operator entered an invalid value for minutes.	Enter a valid value of 00 to 59 minutes.

I-1. MESSAGES (cont).

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
ENTRY MUST BE IN THE RANGE OF 01 TO 31	While in the Set Up screen, operator entered an illegal number of a day of the month.	Enter a valid number from 01 to 31.
ENTRY NUMBER XX GREATER THAN 12 NOT ALLOWED.	While in the Front Line Trace screen, the entry number was more than "12" taken from the FL TRACE message.	None.
ENTRY XX DATA CREATES DUPLICATE FLOT POINTS	While in the FLOT Data screen, the operator has entered points that duplicate points that were previously entered.	Enter points which are not duplications.
ENTRY XX, YY CANNOT SKIP HIGHEST POINT WITH DATA	FLOT screen - Entry Number is 2 or more greater than the highest FLOT point that contains data AND either entry number is NOT greater than 12 AND entry numbers are NOT the same, and both entries do not contain the same location data, and NO invalid data.	Enter points in consecutive order.
FAIL POINT OUTSIDE MAPMOD	Illum Round Fail Point location is outside the MAP MOD.	Check data and reenter.
FLOT(S) OUTSIDE MAPMOD - DELETED	One or more FLOTS are outside the new MAP MOD.	Not an error.
FO XXX ALTITUDE ASSUMED SAME AS GUN ALTITUDE	The chosen FO does not have a defined altitude.	None. FO altitude will then be the same as this mission's Base Gun Altitude.
FO CALL ALREADY ASSIGNED - RE-ENTER	Duplicate FO CALL was entered.	Reenter a unique FO CALL.
FO DIRECTIONS DO NOT INTERSECT AT A POINT	In the Record MPI Sightings screen, FORWARD OBSERVER 1 and FORWARD OBSERVER 2 directions do NOT intersect at a point.	Sighting data is invalid.
FO FILE FULL - DELETE REQUIRED	Exactly 12 Forward Observers exist.	12 FOs are stored; delete an FO to enter a new FO location.
FO(S) OUTSIDE MAPMOD - DELETED	One or more FOs are outside the new MAP MOD.	Not an error.
FP - SOLUTION IS OUTSIDE MAPMOD	Illum Round Fail Point location is outside the MAP MOD.	Adjust.
FPF LINE(S) OUTSIDE MAPMOD - DELETED	One or more FPF lines are outside the new MAP MOD.	Not an error.

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
HOURS MUST BE BETWEEN 00 AND 23	Value entered for hour is an invalid value.	Not an error.
INVALID CORRIDOR	Operator has entered values for the ACA points that do not represent a valid ACA configuration.	Enter ACA point values that more closely represent a box shape for the corridor.
KNPT ID ALREADY ASSIGNED - RE-ENTER	Duplicate KNPT was entered.	Not an error.
KNPT(S) OUTSIDE MAPMOD - DELETED	One or more KNPTs are outside the new MAP MOD.	Not an error.
LAT(S) OUTSIDE MAPMOD - DELETED	One or more LBs are outside the new MAP MOD.	Not an error.
LEFT MIN AND MAX MUST BE DIFFERENT	Left Min and Max values are the same.	Not an error.
MAPMOD CHANGED-DEL INVALID LOCATIONS?	MAP MOD was changed by operator. All locations are outside the new MAP MOD.	Operator can accept the new MAP MOD and invalid locations will be deleted.
MAX CHARGE MUST NOT BE LESS THAN MIN CHARGE	Entered minimum charge was greater than or equal to the maximum charge.	Enter correct value for charges.
MAX LINE POINT CANNOT BE ON MIN LINE	Entered coordinates are incorrect.	Enter correct value for maximum line point.
MAX. CHARGE MUST BE IN THE RANGE OF 00 TO 10	Entered charge was greater than 10.	Enter a charge within the allowable range.
MAX. RANGE MUST BE BETWEEN 201 AND 9999	Entered range value was incorrect.	Enter a range within the allowable range.
MAXIMUM TGT NUMBER MUST BE GREATER THAN MINIMUM	Entered maximum target number value was less than the minimum target number.	Enter a maximum target number that is greater that the minimum target number.
MESSAGE QUEUE IS ALMOST FULL (15 MESSAGES)	This message will be displayed when the 15th digital message is received into the message queue.	Not an error.
MIN. CHARGE MUST BE IN THE RANGE OF 00 TO 10	Entered charge was greater than 10.	Enter a charge within the allowable range.
MIN RANGE MUST BE BETWEEN 200 AND 9998	Entered range value was incorrect.	Enter a range value within the allowable range.
MINIMUM MUST BE LESS THAN MAXIMUM	Entered minimum charge value was greater than the maximum charge value.	Enter a minimum charge value less than the maximum charge.
MINIMUM TGT NUMBER MUST BE LESS THAN MAXIMUM	Entered minimum target number value was greater than the maximum target number.	Enter a maximum target number that is greater that the minimum target number.

I-1. MESSAGES (cont).

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
MINUTES MUST BE BETWEEN 00 AND 59	Entered minutes value was greater than 59.	Enter a minutes value within the allowable range.
MSG QUEUE FULL - INCOMING COMMO MSG DISCARDED	This message will be displayed when the 20th digital message is received into the message queue.	Operator must use or delete some messages from the message queue. Otherwise, all other incoming messages will be lost.
MUST HAVE AT LEAST 1 FO DEFINED	One FO is required for this fire mission.	Enter one FO location.
MUST HAVE AT LEAST 2 FO's DEFINED	Two FOs are required for this fire mission.	Enter two FO locations.
NEED TWO DIFFERENT POINTS TO FORM MIN LINE	Operator entered duplicate values for a point in the Coordinated Fire Line screen.	Enter unique values to define a point for the Minimum Line.
NET ID ALREADY EXISTS	Operator entered a duplicate Net ID.	Enter a unique Net ID value.
NFA(S) OUTSIDE MAPMOD - DELETED	Changing of the MAP MOD causes the NFA(s) to be outside the MAP MOD.	Not much an operator could do because this is the remainder after the fact. Redefine the NFA(s) if needed.
NO ALT FOR FO - BASE GUN ALTITUDE ASSUMED	A FO CALL without defined Altitude is selected for a Polar Mission.	Select a different FO with defined Altitude, or accept the assumption that the FO and the Base Gun are at the same Altitude.
NO ALT FOR FO 1 - VERT ANGLE NOT ALLOWED	The Point Type is FO and the Altitude of the selected FO 1 CALL is not defined during an Intersection Survey.	Select a different FO with defined Altitude, or accept that the Vertical Angle will not be used.
NO ALT FOR KNPT - BASE GUN ALTITUDE ASSUMED	A Known Point without defined Altitude is selected for a Shift Mission.	Select a different Known Point with defined Altitude, or accept the assumption that the Known Point and the Base Gun are at the same Altitude.
NO ALT FOR KNPT 1 - VERT ANGLE NOT ALLOWED	The Point Type is KNPT and the Altitude of the selected KNPT 1 ID is not defined during an Intersection Survey.	Select a different Known Point with defined Altitude, or accept that the Vertical Angle will not be used.
NO ALT FOR TGT - BASE GUN ALTITUDE ASSUMED	A Target without defined Altitude is selected for a Shift Mission.	Select a different Target with defined Altitude, or accept the assumption that the Target and the Base Gun are at the same Altitude.

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
NO AVAILABLE MESSAGES	FO MESSAGE QUEUE is selected when no message is in the queue.	Acknowledge the message.
NO FO ASSOCIATED WITH THIS MISSION	SETUP SHOT/SPLASH is selected for a current mission when FO CALL is left to NONE during the mission setup.	Ensure that a digital FO is selected for a fire mission if digital SHOT and SPLASH is required.
NO MORE POINTS AVAILABLE	INSERT PT is pressed in the FORWARD LINE OF TROOP DATA screen when 12 points are defined.	Delete a point first if inserting a point is required.
NO MORE REGISTRATION POINTS AVAILABLE	PRECISION or MEAN POINT OF IMPACT is selected from the REGISTRATION MENU when 16 registration points are defined.	Delete at least one registration point before selecting the registration mission.
NO MORE TARGET NUMBERS AVAILABLE	A fire mission is selected but the target number of the current mission exceeds the maximum target number of the SET UP screen.	Expand the Target number block from the SET UP screen.
NO MORE TARGETS/KNOWN POINTS AVAILABLE	RECORD SURVEYED TARGET or RECORD NON-SURVEYED TARGET is selected from END OF MISSION MENU when total of 50 targets/known points are defined.	Delete at least one target or known point before performing the EOMRAT.
NO SECTIONS AVAILABLE FOR FPF	INITIALIZE LINE is selected from FINAL PROTECTIVE FIRE MENU when no section has at least one weapon fully defined.	Fully define at least one weapon before initializing the FPF line.
NVM DATA WRITE FAIL, SUSPEND FURTHER NVM OPERATION	The software tried to store NVM data but failed.	The computer is still operational except that the data thereafter will not be saved after the computer is shut down. Send the computer for repair at the earliest convenience.
OCTANT MUST BE BETWEEN 0 AND 9 (BUT NOT 4)	Self explanatory.	Enter the valid data.
OVERRIDE WARNINGS?	Any safety violation for a fire mission is acknowledged or the firing commands/data are being transmitted to the mortar(s) violating the safety geometry.	The operator could either press "YES" or "NO". A "YES" answer overrides the warning and allows the fire data to be displayed or transmitted; a "NO" answer prevents the fire data from being displayed or transmitted.

I-1. MESSAGES (cont).

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
OVERWRITE EXISTING TARGET?	A location is saved as Target though EOM or Survey while the same target number already exists.	The operator could either press "YES" or "NO".
POINT CREATES CROSSING LINE	Point entered crossing line in the Forward Line of Troops Data screen.	Re-enter the data so that the crossing line does not occur.
PRESSURE MUST BE BETWEEN 000 AND 999	Self explanatory.	Enter the valid data.
PROJECTILE INVENTORY LOW XX ROUNDS REMAIN	The calculated projectile inventory is less than the Ammo Low Warning Limit.	Acknowledge the message.
RANGE TOO FAR	The calculated range is beyond the range of the mortar.	Acknowledge the message; recheck the Gun and Target location for accuracy. End the current mission. Enter a new mission with the target inside the range of the mortar.
RANGES MUST OVERLAP PREV SAFETY FAN RANGES	The last entered Safety Fan ranges do not overlap the previous Safety Fan ranges.	Re-enter the ranges so that they overlap.
REF. AZ. ENTRY MUST BE IN THE RANGE OF 0000 TO 6399	Self explanatory.	Enter the valid data.
REG CORR WILL BE UPDATED IN REG DATA AT USE ALL	Registration is selected from the Current Mission Menu when the Registration Identification Information matches a registration point that already exists.	Acknowledge the message and continue or perform a different registration mission.
REG PT(S) OUTSIDE MAPMOD - DELETED	Changing of the MAP MOD causes the Registration Point(s) to be outside the MAP MOD.	Not much an operator could do because this is the remainder after the fact. Re-enter the Registration point(s) or perform a Registration mission again if needed.
RFA(S) OUTSIDE MAPMOD - DELETED	Changing of the MAP MOD causes the Restricted Fire Area(s) to be outside the MAP MOD.	Not much an operator could do because this is the remainder after the fact. Redefine the RFA(s) if needed.
RFL(S) OUTSIDE MAPMOD - DELETED	Changing of the MAP MOD causes the Restricted Fire Line(s) to be outside the MAP MOD.	Not much an operator could do because this is the remainder after the fact. Redefine the RFL(s) if needed.

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
RIGHT MIN AND MAX MUST BE DIFFERENT	The entered right side minimum and maximum points are identical.	Ensure the minimum and maximum points are different.
RP IDENTIFICATION INFO SAME AS POINT XX	REGISTRATION is selected from Current Mission Menu when the registration identification matches a registration point already exists.	Acknowledge the message.
RP XX WILL BE DELETED AT USE ALL	"RP IDENTIFICATION INFO SAME AS POINT XX" message was acknowledged.	Acknowledge the message.
SAFETY FAN MUST BE GREATER THAN 4 MILS	Self explanatory.	Enter the valid data.
SAFETY FAN MUST NOT BE GREATER THAN 3200 MILS	Self explanatory.	Enter the valid data.
SAFETY FAN OUTSIDE MAPMOD	Entered Safety Fan outside the MAP MOD.	Redefine the Safety Fan inside the MAP MOD.
SAFETY FAN(S) OUTSIDE MAPMOD - DELETED	Changing of the MAP MOD causes the Safety Fan(s) to be outside the MAP MOD.	Not much an operator could do because this is the remainder after the fact. Redefine the Safety Fan(s) if needed.
SECONDS MUST BE BETWEEN 00 AND 59	Self explanatory.	Enter the valid data.
SECTION(S) OUTSIDE MAPMOD - DELETED	Changing of the MAP MOD causes at least one gun of a section to be outside the MAP MOD.	Not much an operator could do because this is the remainder after the fact. Refine the section(s).
SIGHTING NUMBER MUST BE BETWEEN 1 AND 9	Self explanatory.	Enter the valid data.
SIX SIGHTINGS RECOMMENDED. OVERRIDE?	FINISHED key is pressed before six sightings are stored during a MPI Registration mission.	Press YES if the Sightings are sufficient; otherwise, press NO.
SLANT RANGE MUST BE BETWEEN 0001 AND 9999	Self explanatory.	Enter the valid data.
STATION MUST BE IN THE RANGE 0… TO Z…	Self explanatory.	Enter the valid data.
SUBSCRIBER ID IDENTICAL TO EXISTING FO CALL	Entered Subscriber ID identical to the FO CALL when the Subscriber Type is either FIST or SFO.	Acknowledge the message and enter a different subscriber ID.

I-1. MESSAGES (cont).

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
TARGET LOCATION OUTSIDE MAPMOD	The target location of a mission is outside the MAP MOD (i.e., in a Polar Mission).	Make sure the target location is correctly entered, or change the MAP MOD so that the battle field is somewhat in the middle of the MAP MOD. To avoid this, choose the MAP MOD properly in the Set Up Data screen.
TARGET NUMBER PREFIX MUST BE CHARACTERS 00 - 99	Self explanatory.	Enter the valid data.
TARGET NUMBER SAME AS SAVED TARGET	Process an FO FR message with a target number that matches a saved target number.	Delete the saved target number before processing the FO message.
TARGET TOO WIDE	The target of a special mission is not effective covered by the chosen gun(s).	Acknowledge the message; then continue or add more guns to the mission.
TARGET(S) OUTSIDE MAPMOD - DELETED	Changing of the MAP MOD causes the Target(s) to be outside the MAP MOD.	Not much an operator could do because this is the remainder after the fact.
TGT ID ALREADY ASSIGNED - RE-ENTER	A location was saved as Target while the same target ID already exists.	Enter a different Target ID.
TGT/KNPT FILE FULL - DELETE REQUIRED	A location was saved as Target or Known Point when the total number of Targets and Known Points is 50.	Delete a known point or target before saving the new location.
TIME MUST BE BETWEEN 000 AND 239	Self explanatory.	Enter the valid data.
VALID AREA NOT FORMED BY THESE ENTERED POINTS	Self explanatory.	Enter the valid data.
VALID RANGE FOR ALTITUDE IS -0400 TO 9999	Self explanatory.	Enter the valid data.
VALID RANGE FOR ANGLE IS -1250 TO +1250	Self explanatory.	Enter the valid data.
VALID RANGE FOR AZIMUTH IS 0 TO 6399	Self explanatory.	Enter the valid data.
VALID RANGE FOR DIRECTION IS 0000 TO 6399	Self explanatory.	Enter the valid data.
VALID RANGE IS FROM XXXX TO YYYY	Self explanatory.	Enter the valid data.
VALID RANGE IS FROM 0 TO 9 AND A TO Z	Self explanatory.	Enter the valid data.
VALID RANGE IS FROM 00 TO 99 AND AA TO ZZ	Self explanatory.	Enter the valid data.
VALID RANGE IS FROM AA TO ZZ	Self explanatory.	Enter the valid data.

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
VERT. DISP. MUST BE IN THE RANGE OF 000 TO 999	Self explanatory.	Enter the valid data.
VERTICAL ANGLE MUST BE IN THE RANGE OF 0000 TO 1250	Self explanatory.	Enter the valid data.
WARNING-INVALID AIR PRES TEMP TREND	The entered air pressure divided by air temperature increases as the MET data line increases.	When the warning is given, it does not necessarily indicate that the data is in error; it only suggests that the MET data should be verified if possible.
WARNING-INVALID AIR PRESSURE TREND	The entered air pressure increases as MET data line increases.	When the warning is given, it does not necessarily indicate that the data is in error; it only suggests that the MET data should be verified if possible.
WARNING-INVALID AIR TEMP CHANGE	The line to line change in entered air temperature of the MET data is greater than 20 degrees Kelvin.	When the warning is given, it does not necessarily indicate that the data is in error; it only suggests that the MET data should be verified if possible.
WARNING-INVALID WIND DIR CHANGE	The line to line change in entered wind direction of the MET data is greater than 1000 mils.	When the warning is given, it does not necessarily indicate that the data is in error; it only suggests that the MET data should be verified if possible.
WARNING-INVALID WIND SPEED CHANGE	The line to line change in entered wind speed of the MET data is greater than 15 knots.	When the warning is given, it does not necessarily indicate that the data is in error; it only suggests that the MET data should be verified if possible.
WEAK TRIANGLE	The angle formed by the intersecting lines is less than 400 mils or greater than 3120 mils during an Intersection Survey.	Acknowledge the message. Perform a different Intersection Survey if desired.
WEAPON IS ADJUSTED - READJUST?	Re-adjust the FPF line after Adjust Line is FINISHED.	Press YES or NO depending upon what is appropriate.
WIND DIRECTION MUST BE BETWEEN 000 AND 639	Self explanatory.	Enter the valid data.
WIND SPEED MUST BE BETWEEN 000 AND 063	Self explanatory.	Enter the valid data.
WPN XXX CALCULATED AIMPOINT OUTSIDE MAPMOD	The subsequent adjustment of a mission caused the aimpoint of a weapon to be outside MAP MOD.	Change the MAP MOD so that the battlefield is somewhat in the center of the MAP MOD.

I-1. MESSAGES (cont).

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
WPN XXX CALCULATED ALTITUDE XXXXX OUT OF RANGE	The Altitude adjustment for a FPF line caused the calculated altitude to be outside range (-0400 to 9999).	Re-enter the valid adjustment value.
XX - FLOT VIOLATION	The trajectory of a weapon does not cross the FLOT or the burst point (or fail point in case Ammo is ILL) is within the safety separation zone of the FLOT.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - FORWARD OBSERVER YY IN DANGER	The burst point (or fail point in case Ammo is ILL) is within the Safety separation zone of FO YY.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - FRIENDLY WEAPON YYY IN DANGER	The burst point (or fail point in case Ammo is ILL) is within the Safety separation zone of friendly weapon YYY.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - LEFT SIDE LATERAL BOUNDARY VIOLATION	The burst point (or fail point is case Ammo is ILL) crosses the Left Side Lateral Boundary.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - MAXIMUM FIRE LINE VIOLATION	Gun-Target line crosses the maximum line of the Coordinated Fire Lines.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - MINIMUM FIRE LINE VIOLATION	Gun-Target line fails to cross the minimum line of the Coordinated Fire Lines.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - NO FIRE AREA YYY VIOLATION	The burst point (or fail point in case Ammo is ILL) is within the No Fire Area YYY.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - RESTRICTED FIRE AREA YYY VIOLATION	The burst point (or fail point in case Ammo is ILL) of a restricted Ammo is within the Restricted Fire Area YYY.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.

Table I-1. Operator Alert and Error Messages (cont).

Operator Alert Message	Possible Causes	Expected Operator Action
XX - RESTRICTED FIRE LINE VIOLATION	The Gun-target line crosses the Restricted Fire Line using a restricted Ammo.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - RIGHT SIDE LATERAL BOUNDARY VIOLATION	The burst point (or fail point in case Ammo is ILL) crosses the Right Side Lateral Boundary.	This is a safety violation warning. The operator has the option to override it or not. No Fire data will be displayed if the warning is not overridden.
XX - SAFETY FAN VIOLATION	The burst point (or fail point in case Ammo is ILL) is located outside the defined safety fan or the computed charge is outside the restricted charge range given in the safety fan data.	If this is unexpected, then recheck the target location against the Safety Fan. Otherwise, end the mission and start the new one.
YEAR MUST BE BETWEEN 1999 AND 2055	Self explanatory.	Enter the valid data.

APPENDIX J
CABLE CONTINUITY CHECK DATA

J-1. INTRODUCTION.

This appendix contains the wiring charts that provide information necessary to do pin-to-pin continuity checks on the M31 Mortar Ballistic Computer used on the M577 Fire Direction Center and the M1064 Carrier. Illustrations of the cable connectors are also included in this appendix.

J-2. WIRING CHARTS.

Table J-1. Cable - 4W6 (M577).

Initiating Point			Terminating Point
REF	CONNECTOR	PIN	TERMINAL LUG
1	P1	A	E1 POS
2	P1	B	E1 POS
3	P1	C	E1 POS
4	P1	D	E1 POS
5	P1	E	E1 POS
6	P1	F	E2 NEG
7	P1	G	E2 NEG
8	P1	H	E2 NEG
9	P1	J	E2 NEG
10	P1	K	E2 NEG

J-2. WIRING CHARTS (cont).

Table J-2. Cable - 4W7 (M577).

	Initiating Point			Terminating Point	
REF	CONNECTOR	PIN	CONNECTOR	PIN	
1	P6	1	P10	2	
2	P6	2	P10	7	
3	P6	3	P10	1	
4	P6	4	P10	18	
5	P6	5	P10	7	
6	P6	6	P10	17	
7	P6	11	P2	C	
8	P6	12	P2	A	
9	P6	13	P2	D	
10	P6	14	P2	B	
11	P6	15	P3	5	
12	P6	16	P3	4	
13	P6	17	P3	10	
14	P6	18	P3	9	
15	P3	3	P3	13	
16	P6	40	P8	A	
17	P6	41	P8	B	
18	P6	42	P8	C	
19	P6	43	P8	D	
20	P6	44	P8	E	
21	P6	45	P8	F	
22	P6	46	P9	A	
23	P6	47	P9	B	
24	P6	48	P9	C	
25	P6	49	P9	D	
26	P6	50	P9	E	
27	P6	51	P9	F	
28	P2	J	P4	A	
29	P2	K	P4	B	

Table J-3. Cable - 34W2 (M577).

	Initiating Point			Terminating Point	
REF	CONNECTOR	PIN	CONNECTOR	PIN	
1	P2	D	P1	11	
2	P2	A	P1	12	
3	P2	E	P1	13	
4	P2	B	P1	14	

Table J-4. Cable - 34W4 (M577 / M1064).

	Initiating Point		Terminating Point	
REF	CONNECTOR	PIN	CONNECTOR	PIN
1	P2	A	P1	Black
2	P2	B	P1	White
3	P2	D	P1	Gnd

Table J-5. Cable - 3W6 (M1064).

	Initiating Point		Terminating Point
REF	CONNECTOR	PIN	TERMINAL LUG
1	P1	A	E1 POS
2	P1	B	E1 POS
3	P1	C	E1 POS
4	P1	D	E1 POS
5	P1	E	E1 POS
6	P1	F	E2 NEG
7	P1	G	E2 NEG
8	P1	H	E2 NEG
9	P1	J	E2 NEG
10	P1	K	E2 NEG

Table J-6. Cable - 3W17 (M1064).

	Initiating Point		Terminating Point	
REF	CONNECTOR	PIN	CONNECTOR	PIN
1	P3	3	J1	R
2	P3	4	J1	S
3	P3	5	J1	T
4	P3	6	J1	U
5	P3	9	J1	V
6	P3	10	J1	W
7	P3	11	J1	N
8	P3	12	J1	P
9	P3	18	J1	Y
10	P3	28	J1	X

J-2. WIRING CHARTS (cont).

Table J-6. Cable - 3W17 (M1064) (cont).

	Initiating Point		Terminating Point	
REF	CONNECTOR	PIN	CONNECTOR	PIN
11	P4	A	J1	Z
12	P4	D	J1	<u>a</u>
13	P4	B	J1	<u>b</u>
14	P4	E	J1	<u>c</u>
15	P5	E	J1	E
16	P5	F	J1	F
17	P5	J	J1	G
18	P5	K	J1	H
19	P6	1	P7	2
20	P6	2	P7	7
21	P6	3	P7	1
22	P6	4	P7	18
23	P6	5	P7	7
24	P6	6	P7	17
25	P6	7	J1	A
26	P6	8	J1	B
27	P6	9	J1	C
28	P6	10	J1	D
29	P6	11	P5	C
30	P6	12	P5	A
31	P6	13	P5	D
32	P6	14	P5	B
33	P6	15	J1	J
34	P6	16	J1	K
35	P6	17	J1	L
36	P6	18	J1	M
37	P6	19	P8	B
38	P6	20	P8	A
39	P6	40	P1	A
40	P6	41	P1	B
41	P6	42	P1	C
42	P6	43	P1	D
43	P6	44	P1	E
44	P6	45	P1	F
45	P6	46	P2	A
46	P6	47	P2	B
47	P6	48	P2	C
48	P6	49	P2	D
49	P6	50	P2	E
50	P6	51	P2	F
51	P8	C	P5	G
52	P8	D	P5	H

J-3. CONNECTOR DIAGRAMS.
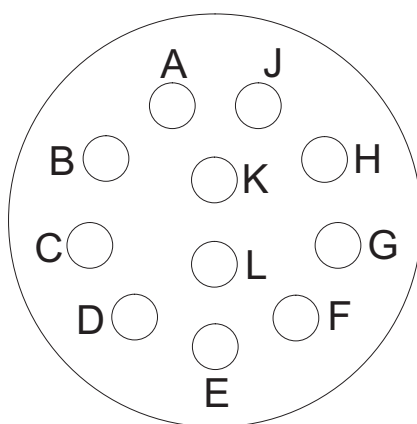
3W6 - P1
4W6 - P1
D38999/26WG11SN
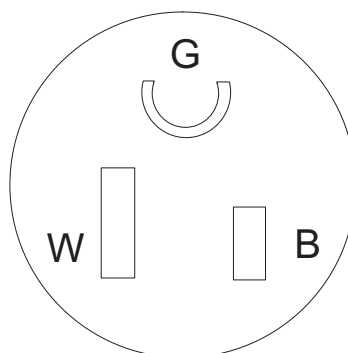
34W4 - P1
HBL5965VBLK

J-3. CONNECTOR DIAGRAMS (cont).
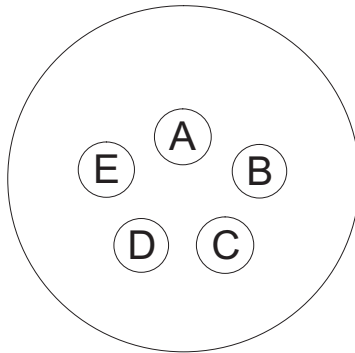
34W4 - P2
D38999/26WD5PN
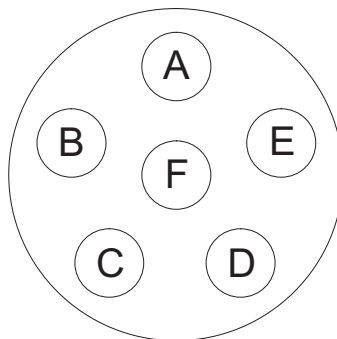
3W17 - P1 & P2
4W7 - P8 & P9
A3167702-2
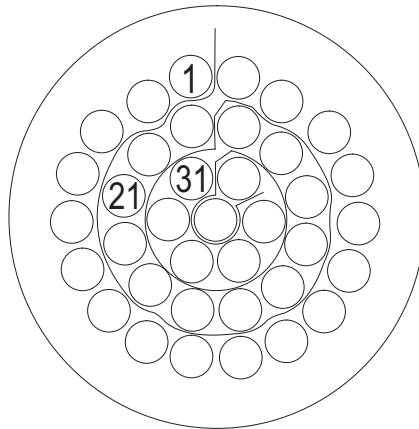
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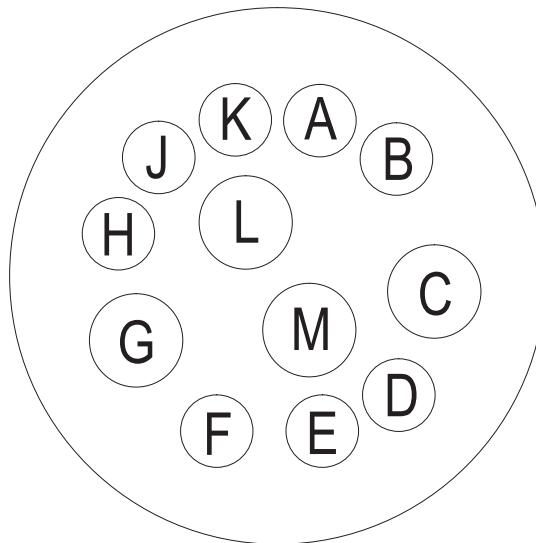
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34W2 - P2
D38999/26WD97PN

J-3. CONNECTOR DIAGRAMS (cont).
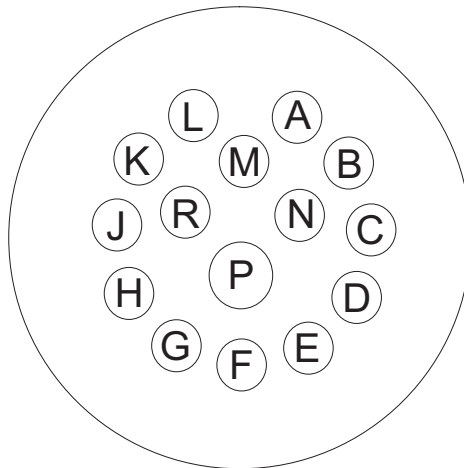
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4W7 - P2
D38999/26WD15PN
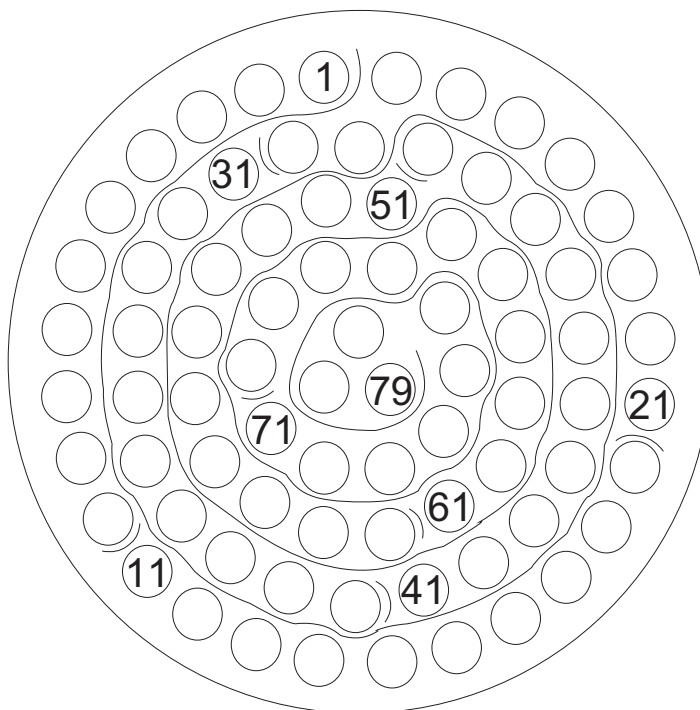
3W17 - P6
4W7 - P6
34W2 - P1
D38999/26WG35SN
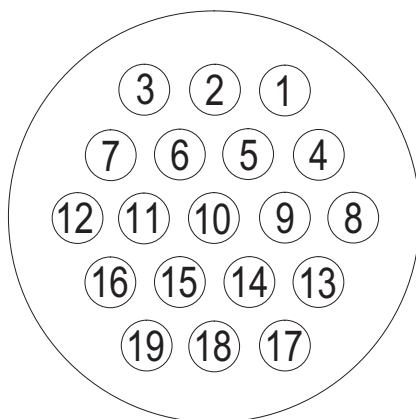
3W17 - P7
4W7 - P10
A3245089-1

3W17 - P8
MS3475W10-6S

J-3. CONNECTOR DIAGRAMS (cont).

3W17 - J1
D38999/24WJ61SN

4W7 - P3
M24308/2-11F
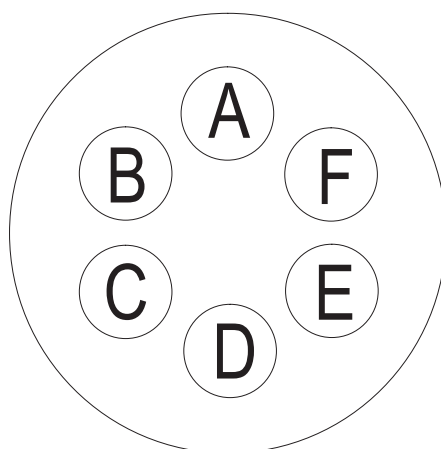
4W7 - P4
MS3471W8-33S

GLOSSARY

Section I. ABBREVIATIONS AND ACRONYMS

AC	Alternating Current
AFATDS	Advanced Field Artillery Tactical Data Systems
ASIP	Advanced System Improvement Program
AUF	Adjust Fire
BIOS	Basic Input Output System
BIT	Built-In Test
CD-ROM	Compact Disk - Read Only Memory
CMD	Color Monitor Display
CNRP	Combat Net Radio Primary
COMSEC	Communications Security
CPC	Corrosion Prevention and Control
CPU	Central Processing Unit
DA	Department of the Army
DC	Direct Current
DCF	Deflection Correction Factor
DMD	Digital Message Device
DNF S/R	Do Not Fire Section/Right
DOD	Department of Defense
DRAM	Dynamic Random Access Memory
EIR	Equipment Improvement Recommendations
EPLRS	Enhanced Positioning Location Reporting System
FED	Forward Entry Device

ABBREVIATIONS AND ACRONYMS (cont).

FIST	Fire Support Team
FM	Field Manual
FO	Forward Observer
FOS	Forward Observers System
FPF	Final Protective Fire
GB	Gigabyte
HF	High Frequency
Hz	Hertz (cycles per second)
kHz	kiloHertz
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MB	Megabyte
MBC	Mortar Ballistic Computer
MHz	Megahertz
MPI	Mean Point of Impact
MS-DOS	Microsoft Disk Operating System
NBC	Nuclear Biological Chemical
OT	Observer Target
PCMCIA	Personal Computer Memory Card International Association
PDA	Power Distribution Assembly
PMCS	Preventive Maintenance Checks and Services
POST	Power On Self Test
PRC-126	Portable Radio, Communication
RAM	Random Access Memory
RAT	Record As Target

RCF	Range Correction Factor
REG CF	Registration Correction Factor
RHDD	Removable Hard Disk Drive
ROD	Report of Discrepancy
RP	Registration Point
SINCGARS	Single-Channel Ground and Airborne Radio System
TAMMS	The Army Maintenance Management System
TM	Technical Manual
V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current
VGA	Video Graphics Adapter
VSRR	Variable Short Range Radio

Section II. TERMS

The following is an alphabetical listing of unusual terms used in this manual and a definition of each.

Address	A number that identifies each location to which the computer can send/receive data.
Boot	The process of starting or restarting the digital computer or loading the operating system into system memory.
Mb	A unit of measure for memory storage. Also called "megabyte". One megabyte is equivalent to 1,048,576 bytes.
PARALLEL Port	Interfaces to printers and other parallel peripheral in which multiple bits of information are transmitted sequentially.
Port	A connection where the cable that carries data to another device is attached.
Serial Interface	An interface between a digital computer and a peripheral in which single bits (1 byte) of information are transmitted simultaneously.
Serial Port	The connector where the connections in the serial interface are made.
VIDEO Port	The connector where the connection is made to an external monitor.
WIRELINE/PSTN	The connectors where connection to field telephone Binding Posts is made.

ALPHABETICAL INDEX

ALPHABETICAL INDEX (CONT)

ALPHABETICAL INDEX (cont)

ALPHABETICAL INDEX (CONT)

PIN: 078992-002

By Order of the Secretary of the Army:

                                                     ERIC K. SHINSEKI
                                               General, United States Army
Official: *Chief of Staff*

Administrative Assistant to the
Secretary of the Army
                0111405

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ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON *(Provide exact wording of recommended changes, if possible).*
	1-1	1-3				The manual referenced in paragraph 1-3 is identified incorrectly. It should be TM 750-244-7.

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THE METRIC SYSTEM AND EQUIVALENTS

INEAR MEASURE
Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS
1 Gram = 0.01 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE
1 Milliliter = 0.001 Liters - 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE
1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer - 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE
1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

TEMPERATURE
5/9 (F° - 32) = C°
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° + 32 = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621